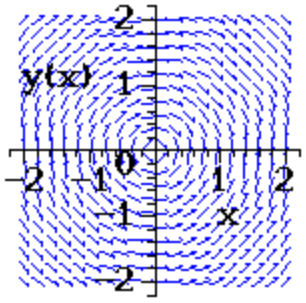
Name: _____ Date: _____

1. Sketch a few solutions of the differential equation on the slope field and then find the general solution analytically.

$$\frac{dy}{dx} = \frac{-x}{y}$$



A) $2y = 2x^2 + C$

B) $y^2 = -2x + C$

C) $y^2 = -x^2 + C$

D) $2y^2 = x^2 + C$

E) $2y = -2x + C$

2. Solve the differential equation.

$$\frac{dy}{dx} = x + 1$$

A) $y = x^2 + x + C$

B) $y = \frac{1}{2}x^2 + x + C$

C) $y = \frac{1}{2}x^2 - x + C$

D) $y = x^2 - x + C$

E) $y = -\frac{1}{2}x^2 - x + C$

3. Assume an object weighing 7 pounds is dropped from a height of 6,000 feet, where the air resistance is proportional to the velocity.

   (i) Write the velocity as a function of time if its velocity after 4 seconds is 1.75 feet per second.

   (ii) What is the limiting value of the velocity function?

   A) (i) $v(t) = 1.7500\left(1 - e^{-18.2857t}\right)$; (ii) 1.7500

   B) (i) $v(t) = 1.7500\left(1 - e^{18.2857t}\right)$; (ii) 1.7500

   C) (i) $v(t) = 1.7500\left(1 - e^{-18.2857t}\right)$; (ii) 0

   D) (i) $v(t) = 1.7500\left(1 - e^{18.2857t}\right)$; (ii) 0

   E) (i) $v(t) = 1.7500\left(1 + e^{18.2857t}\right)$; (ii) Limit does not exist.

4. The number of bacteria in a culture is increasing according to the law of exponential growth. After 2 hours there are 110 bacteria in the culture and after 4 hours there are 370 bacteria in the culture. Answer the following questions, rounding numerical answers to four decimal places.

   (i) Find the initial population.

   (ii) Write an exponential growth model for the bacteria population. Let t represent time in hours.

   (iii) Use the model to determine the number of bacteria after 8 hours.

   (iv) After how many hours will the bacteria count be 10,000?

   A) (i) 32.7027 ; (ii) $y = 32.7027e^{0.6065t}$; (iii) 4,186.1983 ; (iv) 9.4357

   B) (i) 34.8527 ; (ii) $y = 34.8527e^{0.6628t}$; (iii) 6,873.6496 ; (iv) 13.9982

   C) (i) 38.4827 ; (ii) $y = 38.4827e^{0.6699t}$; (iii) 9,625.1030 ; (iv) 16.1094

   D) (i) 40.0427 ; (ii) $y = 40.0427e^{0.6888t}$; (iii) 12,277.5665 ; (iv) 17.8888

   E) (i) 32.7027 ; (ii) $y = 32.7027e^{0.6277t}$; (iii) 5,498.9324 ; (iv) 11.7702

5. Find the particular solution of the differential equation that satisfies the boundary condition.

$4xy' - y = x^3 - 4x$, $y\left(\sqrt{\frac{44}{3}}\right) = 0$

A) $y = \frac{x^3}{3} - \frac{4}{11}x$

B) $y = \frac{x^3}{11} - \frac{4}{3}x$

C) $y = \frac{x^3}{3} + \frac{4}{11}x$

D) $y = \frac{x^3}{11} + \frac{4}{3}x$

E) $y = \frac{x^3}{3} - \frac{4}{3}x$

6. Find the general solution of the differential equation.

$\frac{dy}{dx} = \frac{x^2 - 7}{7y^2}$

A) $\ln\left(7y^3\right) = x^3 - 21x + C$

B) $7y^{-1} = x^3 - 7x + C$

C) $7y^3 = x^3 - 7x + C$

D) $7y^2 = x^3 - 21x^2 + C$

E) $7y^3 = x^3 - 21x + C$

7. Use integration to find a general solution of the differential equation.

$\frac{dy}{dx} = x^2 - 3x$

A) $y = x^2 - 3 + C$

B) $y = x^3 - 3x^2 + C$

C) $y = 2x - 3 + C$

D) $y = \frac{1}{3}x^3 - \frac{3}{2}x^2 + C$

E) $y = x^2 - 3x + C$

8. A 400 gallon tank is full of a solution containing 45 pounds of concentrate. Starting at time $t = 0$, distilled water is admitted to the tank at a rate of 20 gallons per minute, and the well-stirred solution is withdrawn at the same rate.

   (i) Find the amount of concentrate Q in the solution as a function of t.

   (ii) Find the time at which the amount of concentrate in the tank reaches 15 pounds.

   (iii) Find the quantity of the concentrate in the solution as $t \to \infty$.

   A) (i) $Q(t) = 45e^{-400t/20}$; (ii) 27.65 ; (iii) 1

   B) (i) $Q(t) = 45e^{-20t/400}$; (ii) 24.49 ; (iii) 0

   C) (i) $Q(t) = 45e^{-20t/400}$; (ii) 21.97 ; (iii) 0

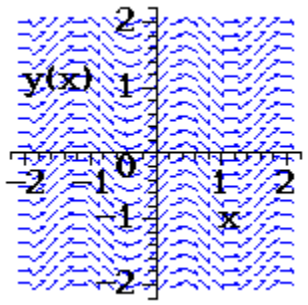
   D) (i) $Q(t) = 45e^{400t/20}$; (ii) 24.49 ; (iii) 1

   E) (i) $Q(t) = 45e^{20t/400}$; (ii) 20.65 ; (iii) 0

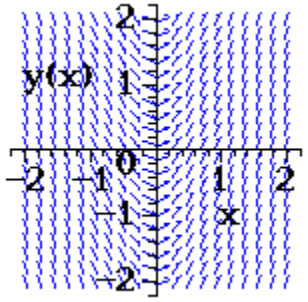
9. Select from the choices below the slope field for the differential equation.

$$\frac{dy}{dx} = \cos(4x)$$

A)



B)



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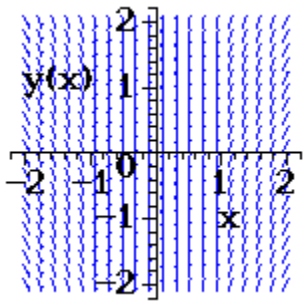
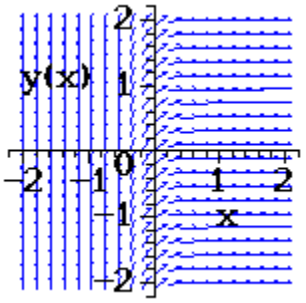


D)



E) Both A and B

10. Find the orthogonal trajectories of the following family.

$y = Ce^{2x}$

A) $y = ke^{-2x}$

B) $2y^2 = -2x + C$

C) $y = C\ln(2x)$

D) $\ln y = 2x + C$

E) $y = 2Ce^{2x}$

11. Find the general solution of the differential equation.

$$\frac{dy}{dx} = \frac{-4x}{y}$$

A) $\ln y = -4x^2 + C$

B) $y^2 = -4x^3 + C$

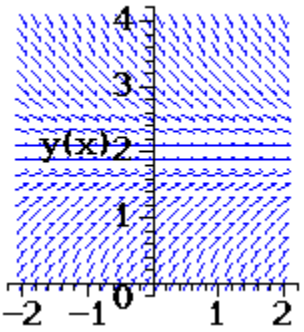
C) $y = -4\ln x + C$

D) $y^2 = -4x^2 + C$

E) Both A and D

12. Sketch a few solutions of the differential equation on the slope field and then find the general solution analytically.

$$\frac{dy}{dx} = 1 - y$$



A) $y = C\ln(1-y)$

B) $y = 1 + Ce^{-x}$

C) $y = 1 - 2Ce^{x}$

D) $y = C\ln(y-1)$

E) both A and C

13. Find the logistic equation that satisfies the following differential equation and initial condition.

$$\frac{dy}{dt} = 2.6y\left(1 - \frac{y}{34}\right), \; y(0) = 4$$

A) $y = \dfrac{34}{1 + \frac{15}{2}e^{-2.6t}}$

B) $y = \dfrac{34}{1 + \frac{19}{2}e^{-2.6t}}$

C) $y = \dfrac{34}{1 + \frac{19}{2}e^{2.6t}}$

D) $y = \dfrac{34}{1 + \frac{15}{2}e^{2.6t}}$

E) None of the above.

14. Solve the differential equation.

$$\frac{dy}{dx}+\frac{8}{x}y=6x+8$$

A) $y=-\frac{3}{5}x^2+\frac{8}{9}x+Cx^{-8}$

B) $y=\frac{3}{5}x^2-\frac{8}{9}x+Cx^{-8}$

C) $y=\frac{5}{3}x^2+\frac{9}{8}x+Cx^{-8}$

D) $y=-\frac{5}{3}x^2+\frac{9}{8}x+Cx^{-8}$

E) $y=\frac{3}{5}x^2+\frac{8}{9}x+Cx^{-8}$

15. Solve the differential equation.

$$y'=\frac{\sqrt{x}}{-3y}$$

A) $y=\sqrt{-\frac{4}{9}x^{3/2}+C}$

B) $-3y^2=4x^{3/2}+C$

C) $-9y^2=2x^{3/2}+C$

D) $-9y^2=4x^{3/2}+C$

E) both A and D

16. Use integration to find a general solution of the differential equation.

$\frac{dy}{dx} = x\sqrt{2-x^2}$

A) $y = -\frac{1}{3}x\left(2-x^2\right)^{\frac{3}{2}} + C$

B) $y = -\frac{1}{3}\left(2-x^2\right)^{\frac{3}{2}} + C$

C) $y = -\frac{1}{5}x\left(2-x^2\right)^{\frac{5}{2}} + C$

D) $y = \frac{1}{5}\left(2-x^2\right)^{\frac{5}{2}} + C$

E) $y = \frac{1}{3}\left(2-x^2\right)^{\frac{3}{2}} + C$

17. Write and solve the differential equation that models the following verbal statement:

The rate of change of P with respect to r is proportional to $10-r$.

A) $\frac{dP}{dr} = k\left(10-r\right)^{-1}$, $P = -k\ln\left(10-r\right) + C$

B) $\frac{dP}{dr} = k\left(10-r\right)$, $P = -\frac{k}{2}\left(10-r\right)^2 + C$

C) $\frac{dP}{dr} = k\left(10-r\right)^2$, $P = -\frac{k}{3}\left(10-r\right)^3 + C$

D) $\frac{dP}{dr} = k\left(10-r\right)^3$, $P = -\frac{k}{4}\left(10-r\right)^4 + C$

E) $\frac{dP}{dr} = k\left(10-r\right)^{-1}$, $P = -k\ln\left(10-r\right)^2 + C$

18. Find the general solution of the differential equation.

$(7+x)y' = 3y$

A) $y^2 = C\cdot(7+x)^3$

B) $y = C\cdot(7+x)^3$

C) $y^2 = C\cdot(7+x)^6$

D) $y = C\cdot\ln(7x)^3$

E) $y^2 = C\cdot(7+x)^6$

19. Use integration to find a general solution of the differential equation.

$\frac{dy}{dx} = x\sqrt{-x-8}$

A) $y = \frac{2}{5}(-x-8)^{5/2} + \frac{16}{3}(-x-8)^{3/2} + C$

B) $y = \frac{2}{5}(-x-8)^{3/2} + \frac{16}{3}(-x-8)^{5/2} + C$

C) $y = \frac{2}{5}(-x-8)^{2} + \frac{16}{3}(-x-8) + C$

D) $y = (-x-8)^{3/2} + (-x-8)^{5/2} + C$

E) Both A and C

20. Find the particular solution of the differential equation that satisfies the boundary condition.

$y' + (4x-12)y = 0$, y(6) = 4

A) $y = 4e^{12x-2x^2}$

B) $y = 4e^{-12x+4x^2}$

C) $y = 4e^{12x+4x^2}$

D) $y = 8e^{-12x-2x^2}$

E) $y = 8e^{12x-2x^2}$

21. Use the shell method to set up and evaluate the integral that gives the volume of the solid generated by revolving the plane region about the *x*-axis.

$y = 5 - x,\ y = 0,\ x = 0$

A) $V = 2\pi\int_0^5 (y)(5-y)dy = \frac{125}{3}\pi$

B) $V = 2\pi\int_0^5 (y)(5-y)dy = \frac{125}{6}\pi$

C) $V = 2\pi\int_0^5 (-y)(5+y)dy = \frac{625}{6}\pi$

D) $V = 2\pi\int_0^5 (y)(5+y)dy = \frac{125}{3}\pi$

E) $V = 2\pi\int_0^5 (y)(5+y)dy = \frac{625}{6}\pi$

22. Find the area of the region bounded by the equations by integrating (i) with respect to x and (ii) with respect to y.

$x = 36 - y^2$

$x = y - 6$

A) $A = \dfrac{1099}{6}$

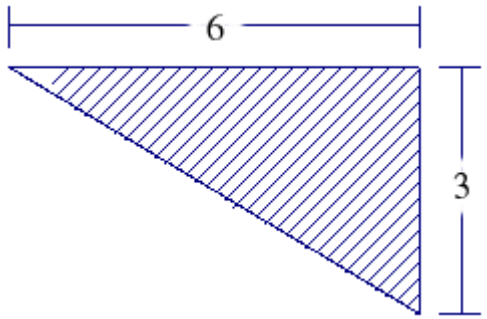
B) $A = \dfrac{2197}{6}$

C) $A = \dfrac{2197}{12}$

D) $A = \dfrac{1099}{12}$

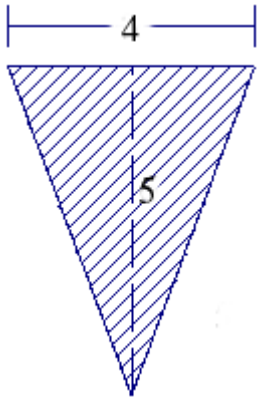
E) $A = \dfrac{2195}{12}$

23. The figure is the vertical side of a form for poured concrete that weighs 140.7 pounds per cubic foot. Dimensions in the figure are in feet. Determine force on this part of the concrete form.



A) 422.1 lb
B) 2,532.6 lb
C) 1,266.3 lb
D) 211.05 lb
E) 70.35 lb

24. Find the fluid force on the vertical side of the tank, where the dimensions are given in feet. Assume that the tank is full of water. Note: The density of water is 62.4 lbs per cubic foot.



A) 832 lb
B) 1,040 lb
C) 208 lb
D) 93.6 lb
E) 10.4 lb

25. Determine the work done by lifting a 90 pound bag of sugar 12 feet.
A) 2,100 ft·lb
B) 210 ft·lb
C) 10,800 ft·lb
D) 108 ft·lb
E) 1,080 ft·lb

26. Set up and evaluate the integral that gives the volume of the solid formed by revolving the region about the *y*-axis.

$y = x^{\frac{12}{13}},\ y = 1,\ x = 0$

A) $V = \pi \int_0^1 y^{\frac{13}{6}} dy = \frac{3}{19}\pi$

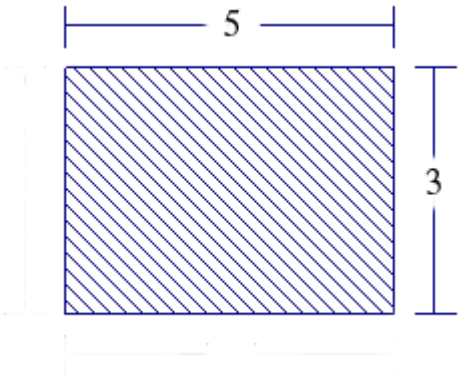
B) $V = \pi \int_0^1 y^{\frac{13}{12}} dy = \frac{6}{19}\pi$

C) $V = \pi \int_0^1 y^{\frac{13}{6}} dy = \frac{6}{19}\pi$

D) $V = \pi \int_0^1 y^{\frac{12}{13}} dy = \frac{3}{19}\pi$

E) $V = \pi \int_0^1 y^{\frac{6}{13}} dy = \frac{6}{19}\pi$

27. The figure is the vertical side of a form for poured concrete that weighs 140.7 pounds per cubic foot. Dimensions in the figure are in feet. Determine force on this part of the concrete form.



A) 140.7 lb
B) 5,276.25 lb
C) 1,055.25 lb
D) 562.8 lb
E) 3,165.75 lb

28. Use the disk *or* shell method to find the volume of the solid generated by revolving the region bounded by the graph of the equation about the given line.

$x^{\frac{2}{3}} + y^{\frac{2}{3}} = 6^{\frac{2}{3}}$

(i) the x-axis; (ii) the y-axis

A) (i) $\frac{576}{35}\pi$; (ii) $\frac{2304}{35}\pi$

B) (i) $\frac{1728}{25}\pi$; (ii) $\frac{1728}{25}\pi$

C) (i) $\frac{2304}{35}\pi$; (ii) $\frac{2304}{35}\pi$

D) (i) $\frac{2304}{35}\pi$; (ii) $\frac{576}{35}\pi$

E) (i) $\frac{432}{25}\pi$; (ii) $\frac{2304}{35}\pi$

29. Find the area of the surface generated by revolving the curve about the y-axis.

$y = 81 - x^2, \quad 0 \le x \le 9$

A) $\frac{26245^{\frac{3}{2}} - 1}{3}\pi$

B) $\frac{26245^{\frac{3}{2}} - 1}{6}\pi$

C) $\frac{325^{\frac{3}{2}} - 1}{12}\pi$

D) $\frac{325^{\frac{3}{2}} - 1}{6}\pi$

E) $\frac{26245^{\frac{3}{2}} - 1}{12}\pi$

30. A cylindrical water tank 5 meters high with a radius of 1 meters is buried so that the top of the tank is 1 meter below ground level. How much work is done in pumping a full tank of water up to ground level? (The water weighs 9800 newtons per cubic meter.)
A) $137{,}200\pi$ N·m
B) $257{,}250\pi$ N·m
C) $171{,}500\pi$ N·m
D) $102{,}900\pi$ N·m
E) $308{,}700\pi$ N·m

31. Find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the given lines.

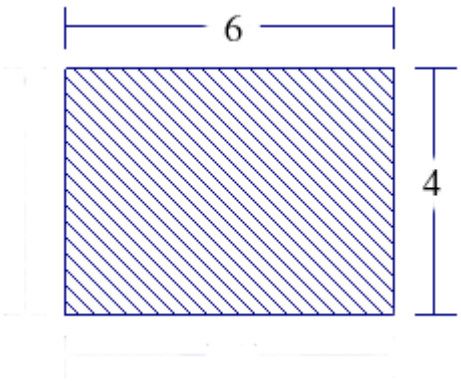
$x = y^2,\ x = 28y - y^2$

(i) y-axis; (ii) the line $x = 198$
A) (i) $\frac{2744}{3}\pi$; $\frac{3528}{3}\pi$
B) (i) $\frac{537824}{3}\pi$; $\frac{548800}{3}\pi$
C) (i) $\frac{2744}{3}\pi$; $\frac{548800}{3}\pi$
D) (i) $\frac{196}{3}\pi$; $\frac{3528}{3}\pi$
E) (i) $\frac{196}{3}\pi$; $\frac{548800}{3}\pi$

32. Find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the line $y = 5$.

$y = x,\ y = 4,\ x = 0$
A) $\frac{112}{3}\pi$
B) $\frac{56}{3}\pi$
C) $\frac{160}{3}\pi$
D) π
E) $\frac{56}{3}\pi$

33. Find the fluid force on the vertical side of the tank, where the dimensions are given in feet. Assume that the tank is full of water. Note: The density of water is 62.4 lbs per cubic foot.



A) 312 lb
B) 4,492.8 lb
C) 748.8 lb
D) 2,995.2 lb
E) 62.4 lb

34. Set up and evaluate integrals for finding the area and moments about the x- and y-axes for the region bounded by the graphs of the equations. (Assume $\rho = 1$.)

$y = 196 - x^2, \quad y = 0$

A) $A = 2\int_0^{14} \left(x^2 - 196\right) dx = \frac{10,976}{3}$; $M_x = 0$ by symmetry;

$M_y = \frac{1}{2}\int_{-14}^{14} \left(x^2 - 196\right)^2 dx = -\frac{4,302,592}{15}$

B) $A = \int_{-14}^{14} -\left(x^2 - 196\right) dx = \frac{10,976}{3}$; $M_x = 0$ by symmetry;

$M_y = \frac{1}{2}\int_{-14}^{14} \left(x^2 - 196\right)^2 dx = -\frac{4,302,592}{15}$

C) $A = \int_{-14}^{14} -\left(x^2 - 196\right) dx = \frac{10,976}{3}$; $M_x = \frac{1}{2}\int_{-14}^{14} \left(x^2 - 196\right)^2 dx = \frac{4,302,592}{15}$; $M_y = 0$ by symmetry

D) $A = 2\int_0^{14} \left(x^2 - 196\right) dx = \frac{10,976}{3}$; $M_x = \frac{1}{2}\int_{-14}^{14} \left(x^2 - 196\right)^2 dx = -\frac{4,302,592}{15}$; $M_y = 0$

E) Both B and D
F) Both A and C

35. Neglecting air resistance and the weight of the propellant, determine the work done in propelling a 7-ton satellite to a height of

(i) 100 miles above Earth

(ii) 350 miles above Earth

Assume that Earth has a radius of 4000 miles.

A) (i) 409.76 mi · ton; (ii) 1,351.72 mi · ton
B) (i) 1,024.39 mi · ton; (ii) 3,379.31 mi · ton
C) (i) 546.34 mi · ton; (ii) 1,802.30 mi · ton
D) (i) 682.93 mi · ton; (ii) 2,252.87 mi · ton
E) None of the above

36. Find the area of the region bounded by the graphs of the algebraic functions.

$f(x) = \sqrt[3]{x-9}$

$g(x) = x - 9$

A) $A = \frac{1}{27}$

B) $A = \frac{1}{18}$

C) $A = \frac{1}{2}$

D) $A = \frac{17}{18}$

E) $A = \frac{26}{27}$

37. Find the center of mass of the point masses lying on the x-axis.

m_i	10	7	3	2	4
(x_i, y_i)	$(-1,-6)$	$(10,-9)$	$(0,1)$	$(-1,-7)$	$(6,0)$

A) $\bar{x} = \frac{41}{13}, \bar{y} = -\frac{67}{13}$

B) $\bar{x} = \frac{85}{29}, \bar{y} = -\frac{131}{29}$

C) $\bar{x} = \frac{85}{26}, \bar{y} = -\frac{131}{26}$

D) $\bar{x} = \frac{42}{13}, \bar{y} = -\frac{66}{13}$

E) $\bar{x} = \frac{81}{26}, \bar{y} = -\frac{135}{26}$

38. Find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the x-axis. Verify your results using the integration capabilities of a graphing utility.

$y = \cos(x),\ y = 0,\ x = 0,\ x = \frac{\pi}{3}$

A) $\frac{1}{3}\pi^2 - \frac{\sqrt{3}}{8}\pi$

B) $\frac{1}{6}\pi^2 - \frac{\sqrt{3}}{8}\pi$

C) $\frac{1}{6}\pi^2 + \frac{\sqrt{3}}{4}\pi$

D) $\frac{1}{6}\pi^2 + \frac{\sqrt{3}}{8}\pi$

E) $\frac{1}{3}\pi^2 + \frac{\sqrt{3}}{8}\pi$

39. Use the disk *or* shell method to find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the given line.

$y = x^3,\ y = 0,\ x = 11$

(i) the x-axis; (ii) the y-axis; (iii) the line $x = 22$

A) (i) $\frac{38974342}{7}\pi$; (ii) $\frac{322102}{5}\pi$; (iii) $\frac{483153}{5}\pi$

B) (i) $\frac{19487171}{7}\pi$; (ii) $\frac{161051}{5}\pi$; (iii) $\frac{483153}{5}\pi$

C) (i) $\frac{38974342}{7}\pi$; (ii) $\frac{322102}{5}\pi$; (iii) $\frac{322102}{5}\pi$

D) (i) $\frac{19487171}{7}\pi$; (ii) $\frac{322102}{5}\pi$; (iii) $\frac{483153}{5}\pi$

E) (i) $\frac{38974342}{7}\pi$; (ii) $\frac{161051}{5}\pi$; (iii) $\frac{322102}{5}\pi$

40. Find the area of the surface generated by revolving the curve about the y-axis.

$y = \sqrt{64 - x^2},\quad 0 \le x \le 7$

A) $28\left(8 - \sqrt{15}\right)\pi$

B) $14\left(7 - \sqrt{15}\right)\pi$

C) $32\left(8 - \sqrt{15}\right)\pi$

D) $14\left(8 - \sqrt{15}\right)\pi$

E) $16\left(8 - \sqrt{15}\right)\pi$

41. Find the indefinite integral.

$$\int \frac{w^2}{w+12}\,dw$$

A) $144\ln|w+12|+\frac{w^2}{2}-12w+C$

B) $144\ln|w+12|-13w+C$

C) $\ln|w+12|+\frac{w^2}{2}-12w+C$

D) $144\ln|w+12|+\frac{w^2}{2}-13w+C$

E) $\ln|w+12|+\frac{w^2}{2}-13w+C$

42. Find the indefinite integral.

$$\int \sin^3\frac{x}{2}\,dx$$

A) $-\frac{2\left(3-\cos^2\frac{x}{2}\right)\cos\frac{x}{2}}{3}+C$

B) $-\frac{2\left(2-\cos^2\frac{x}{2}\right)\cos\frac{x}{2}}{3}+C$

C) $\frac{2\left(3-\cos^2\frac{x}{2}\right)\cos\frac{x}{2}}{3}+C$

D) $\frac{2\left(1+\cos^2\frac{x}{2}\right)\cos\frac{x}{2}}{3}+C$

E) $\frac{2\left(2-\cos^2\frac{x}{2}\right)\cos\frac{x}{2}}{3}+C$

43. Find the indefinite integral by making the substitution $x = 4\tan\theta$.

$\int x\sqrt{16+x^2}\,dx$

A) $\dfrac{\left(x^2+16\right)^{3/2}}{2}+C$

B) $\dfrac{2\left(x^2+16\right)^{3/2}}{3}+C$

C) $-\dfrac{\left(x^2+16\right)^{3/2}}{3}+C$

D) $-\dfrac{2\left(x^2+16\right)^{3/2}}{3}+C$

E) $\dfrac{\left(x^2+16\right)^{3/2}}{3}+C$

44. Find the indefinite integral by making the substitution $x = 6\sin\theta$.

$\int \dfrac{x}{\left(36-x^2\right)^{3/2}}\,dx$

A) $\dfrac{1}{\sqrt{36-x^2}}+C$

B) $-\dfrac{3}{2\sqrt{36-x^2}}+C$

C) $\dfrac{3}{2\sqrt{36-x^2}}+C$

D) $-\dfrac{1}{\sqrt{36-x^2}}+C$

E) None of the above

45. Find the definite integral.

$$\int_3^4 \frac{\sqrt{x^2-9}}{x^2}\,dx$$

A) $\ln\left(\sqrt{7}+4\right)-\ln 3+\dfrac{\sqrt{7}}{4}$

B) $\ln\left(\sqrt{7}+4\right)-\ln 3-\dfrac{\sqrt{7}}{4}$

C) $\ln\left(\sqrt{7}+4\right)-\ln 3-\dfrac{1}{4\sqrt{7}}$

D) $\ln\left(\sqrt{7}+4\right)-\dfrac{\sqrt{7}}{4}$

E) $\ln\left(\sqrt{7}+4\right)+\ln 3-\dfrac{1}{4\sqrt{7}}$

46. Find the indefinite integral.

$$\int \tan^5\left(\frac{x}{5}\right)dx$$

A) $\tan^2\left(\dfrac{x}{5}\right)\cdot\left(1+\dfrac{5}{4}\tan^2\left(\dfrac{x}{5}\right)\right)-5\ln\left|\cos\left(\dfrac{x}{5}\right)\right|+C$

B) $\tan^2\left(\dfrac{x}{5}\right)\cdot\left(1-\dfrac{5}{4}\tan^2\left(\dfrac{x}{5}\right)\right)-5\ln\left|\cos\left(\dfrac{x}{5}\right)\right|+C$

C) $\dfrac{5}{2}\tan^2\left(\dfrac{x}{5}\right)\cdot\left(\dfrac{1}{2}\tan^2\left(\dfrac{x}{5}\right)-1\right)-5\ln\left|\cos\left(\dfrac{x}{5}\right)\right|+C$

D) $\dfrac{5}{2}\tan^2\left(\dfrac{x}{5}\right)\cdot\left(1-\dfrac{5}{4}\tan^2\left(\dfrac{x}{5}\right)\right)+5\ln\left|\cos\left(\dfrac{x}{5}\right)\right|+C$

E) $\tan^2\left(\dfrac{x}{5}\right)\cdot\left(1+\dfrac{5}{4}\tan^2\left(\dfrac{x}{5}\right)\right)+5\ln\left|\sin\left(\dfrac{x}{5}\right)\right|+C$

47. Find the indefinite integral.

$$\int \frac{12p}{p+15}\,dp$$

A) $180\ln|p+15|+12p+C$

B) $-180\ln|p+15|+12p^2+C$

C) $-180\ln|p+15|-12p+C$

D) $-180\ln|p+15|+12p+C$

E) $180\ln|p+15|+12p^2+C$

48. Find the indefinite integral by making the substitution $x=6\sin\theta$.

$$\int \frac{1}{x^2\sqrt{36-x^2}}\,dx$$

A) $\dfrac{\sqrt{36-x^2}}{36x}+C$

B) $-\dfrac{\sqrt{36-x^2}}{36x}+C$

C) $-\dfrac{1}{36x\left(36-x^2\right)^{3/2}}+C$

D) $-\dfrac{\sqrt{36-x^2}}{36x^2}+C$

E) $\dfrac{1}{36x\left(36-x^2\right)^{3/2}}+C$

49. Find the indefinite integral.

$$\int \frac{9x^2}{e^x}\,dx$$

A) $9\left(x^2-2x+2\right)e^{-x}+C$

B) $-\left(x^2+2x+2\right)e^{-x}+C$

C) $\left(x^2+2x+2\right)e^{-x}+C$

D) $-9x\left(x^2+2x+2\right)e^{-x}+C$

E) $-9\left(x^2+2x+2\right)e^{-x}+C$

50. Find the indefinite integral.

$\int 9(x+4)^8\,dx$

A) $(x+4)^8 + C$
B) $(x+4)^7 + C$
C) $(x+4)^9 + C$
D) $9(x+4)^9 + C$
E) $8(x+4)^8 + C$

51. Find the indefinite integral by making the substitution $x = 8\sin\theta$.

$\int \frac{\sqrt{64-x^2}}{x}\,dx$

A) $\sqrt{64-x^2} + 8\ln\left|\frac{8+\sqrt{64-x^2}}{x}\right| + C$

B) $\left(64-x^2\right)^{3/2} - 8\ln\left|\frac{8+\sqrt{64-x^2}}{x}\right| + C$

C) $\sqrt{64-x^2} - 8\ln\left|\frac{8+\sqrt{64-x^2}}{x^2}\right| + C$

D) $\sqrt{64-x^2} - 8\ln\left|\frac{8+\sqrt{64-x^2}}{x}\right| + C$

E) $\left(64-x^2\right)^{3/2} + 8\ln\left|\frac{8+\sqrt{64-x^2}}{x}\right| + C$

52. Find the indefinite integral.

$\int \sec^4 5x\,dx$

A) $\frac{1}{15}\tan(5x)\left(3-\tan^2(5x)\right) + C$

B) $-\frac{1}{15}\tan(5x)\left(3+\tan^2(5x)\right) + C$

C) $\frac{1}{15}\tan(5x)\left(3+\tan(5x)\right) + C$

D) $\frac{1}{15}\tan(5x)\left(3+\tan^2(5x)\right) + C$

E) $\frac{1}{15}\tan(5x)\left(3-\tan(5x)\right) + C$

53. Find the indefinite integral.

$$\int x\sqrt{25-36x^2}\,dx$$

A) $\dfrac{\left(36x^2+25\right)\sqrt{25-36x^2}}{108}+C$

B) $\dfrac{\sqrt{\left(25-36x^2\right)^3}}{108}+C$

C) $-\dfrac{\left(25-36x^2\right)^{5/2}}{108}+C$

D) $-\dfrac{\sqrt{\left(25-36x^2\right)^3}}{108}+C$

E) None of the above

54. Find the indefinite integral.

$$\int \frac{1}{\left(x^2+7\right)^{3/2}}\,dx$$

A) $\dfrac{x}{7\sqrt{x^2+7}}+C$

B) $7x\sqrt{x^2+7}+C$

C) $-\dfrac{x}{7\sqrt{x^2+7}}+C$

D) $\dfrac{x^2}{7\sqrt{x^2+7}}+C$

E) $-\dfrac{x^2}{7\sqrt{x^2+7}}+C$

55. Find the indefinite integral by making the substitution $x = 3\tan\theta$.

$$\int \frac{x^3}{\sqrt{9+x^2}}\,dx$$

A) $\dfrac{\sqrt{9+x^2}\left(18-x^2\right)}{3}+C$

B) $\dfrac{\sqrt{9+x^2}\left(x^2-18\right)}{3}+C$

C) $\dfrac{2\sqrt{9+x^2}\left(x^2-18\right)}{3}+C$

D) $\dfrac{\sqrt{9+x^2}\left(x^2-9\right)}{3}+C$

E) $\dfrac{2\sqrt{9+x^2}\left(x^2-18\right)}{3}+C$

56. Find the indefinite integral.

$$\int \sin^2 4x\,dx$$

A) $\dfrac{4x-\sin 4x\cos 4x}{8}+C$

B) $\dfrac{4x+\sin 4x\cos 4x}{8}+C$

C) $\dfrac{4x-\sin 4x\cos 4x}{4}+C$

D) $\dfrac{4x-\sin^2 4x\cos 4x}{8}+C$

E) $\dfrac{4x+\sin 4x\cos 4x}{4}+C$

57. Find the indefinite integral.

$\int \cos^3 2x\,dx$

A) $\dfrac{\sin 2x\left(3-\sin^2 2x\right)}{6}+C$

B) $\dfrac{\sin 2x\left(3+\sin^2 2x\right)}{3}+C$

C) $\dfrac{\sin 2x\left(3+\sin^4 2x\right)}{6}+C$

D) $\dfrac{\sin 2x\left(3-\sin^4 2x\right)}{6}+C$

E) $\dfrac{\sin 2x\left(3+\sin^2 2x\right)}{6}+C$

58. Find the indefinite integral.

$\int \left[y-\dfrac{9}{(y-5)^8}\right]dy$

A) $\dfrac{y^2}{2}+\dfrac{9}{7(y-5)^8}+C$

B) $\dfrac{y^2}{2}+\dfrac{9}{7(y-5)^7}+C$

C) $\dfrac{y^2}{2}+\dfrac{9}{7(y-5)^9}+C$

D) $\dfrac{y^2}{2}-\dfrac{1}{(y-5)^9}+C$

E) $\dfrac{y^2}{2}-\dfrac{9}{8(y-5)^8}+C$

59. Find the indefinite integral.

$\int x^9 \ln x \, dx$

A) $\frac{x^{10}}{81}\left[\ln\left(x^{10}\right)-1\right]+C$

B) $\frac{x^9}{100}\left[\ln\left(x^9\right)-1\right]+C$

C) $\frac{x^8}{100}\left[\ln\left(x^8\right)-1\right]+C$

D) $\frac{x^{10}}{100}\left[\ln\left(x^{10}\right)-1\right]+C$

E) $\frac{x^{10}}{100}\left[\ln\left(x^9\right)-1\right]+C$

60. Find the indefinite integral.

$\int \frac{7}{(r-5)^7} \, dr$

A) $-\frac{7}{6(r-5)^7}+C$

B) $-\frac{7}{6(r-5)^8}+C$

C) $-\frac{7}{6(r-5)^6}+C$

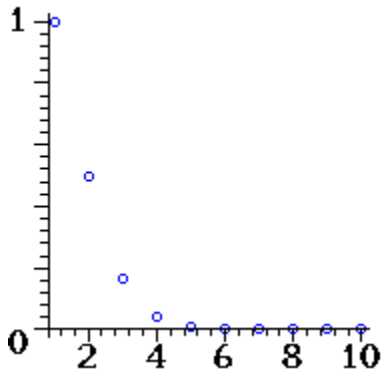
D) $\frac{7}{8(r-5)^8}+C$

E) $\frac{1}{(r-5)^7}+C$

61. Match the sequence with its graph.

$a_n = \dfrac{2}{n+1}$

A)



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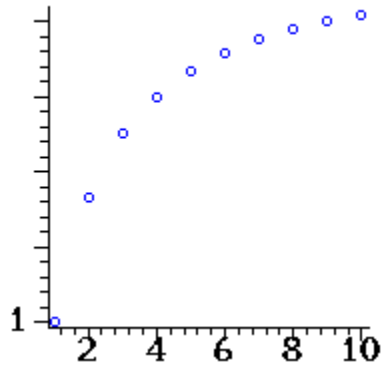

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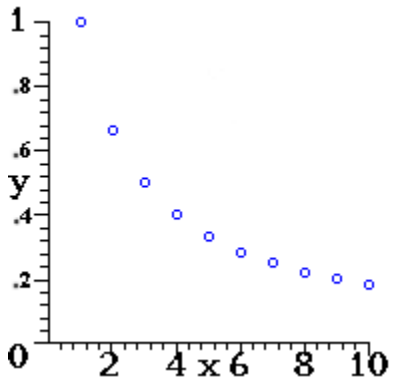

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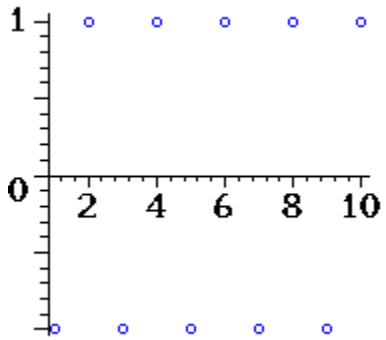

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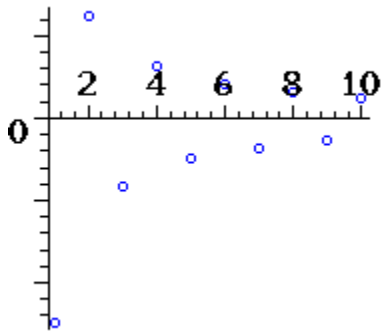


62. Write the first five terms of the sequence.

$a_n = 5 - \frac{5}{n} - \frac{5}{n^2}$

A) $-5, \frac{5}{4}, \frac{25}{9}, \frac{55}{16}, \frac{19}{5}$

B) $-5, -\frac{5}{2}, -\frac{5}{3}, -\frac{5}{4}, -\frac{1}{1}$

C) $-5, -\frac{5}{4}, -\frac{5}{9}, -\frac{5}{16}, -\frac{1}{5}$

D) $-5, \frac{5}{4}, -\frac{5}{9}, \frac{5}{16}, -\frac{1}{5}$

E) $-5, -\frac{5}{4}, \frac{25}{9}, -\frac{55}{16}, \frac{19}{5}$

63. Determine the convergence or divergence of the series using any appropriate test from this chapter. Identify the test used.

$$\sum_{n=1}^{\infty} \frac{5}{n^{-6}}$$

A) Converges; *p*-series
B) Diverges; *p*-series
C) Diverges; Ratio Test
D) Converges; Integral Test
E) Both A and C
F) Both B and D

64. Use Theorem 9.11 to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \frac{4}{n^{\frac{2}{5}}}$$

A) Theorem 9.11 is inconclusive
B) Converges
C) Diverges

65. Use the power series

$$\frac{1}{1+x} = \sum_{n=0}^{\infty} (-1)^n x^n$$

to determine a power series, centered at 0, for the function. Identify the interval of convergence.

$$h(x) = \frac{-10}{x^2 - 1}$$

A) $\sum_{n=0}^{\infty} (-1)^n 10x^{2n},\ x \in (-1,1)$

B) $\sum_{n=0}^{\infty} 10x^{2n},\ x \in (-1,1)$

C) $\sum_{n=0}^{\infty} 10x^n,\ x \in (-1,1)$

D) $\sum_{n=0}^{\infty} (-1)^n 10x^n,\ x \in (-1,1)$

E) $\sum_{n=0}^{\infty} 5x^n,\ x \in (-1,1)$

66. Find the sum of the convergent series.

$$\sum_{n=0}^{\infty} 6\left(-\frac{9}{10}\right)^n$$

A) $\frac{66}{19}$

B) $\frac{54}{19}$

C) $\frac{60}{17}$

D) $\frac{60}{19}$

E) $\frac{66}{17}$

67. Use the Root Test to determine the convergence or divergence of the series.

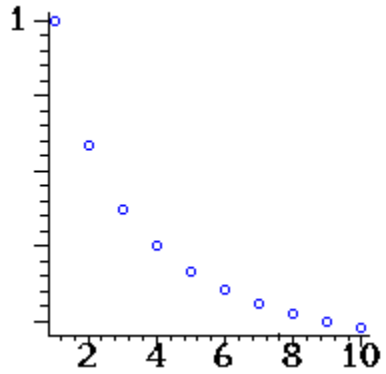
$$\sum_{n=1}^{\infty}\left(\frac{7n^2+1}{5n^2-1}\right)^n$$

A) Root Test is inconclusive
B) Converges
C) Diverges

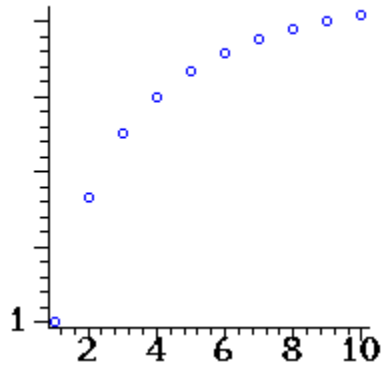
68. Match the sequence with its graph.

$a_n = (-1)^n$

A)



B)



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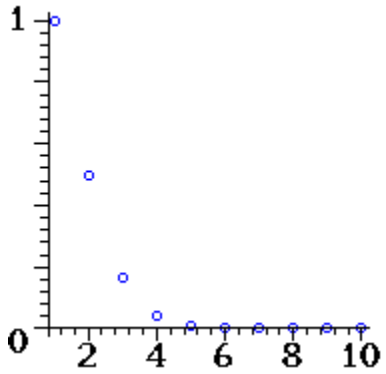

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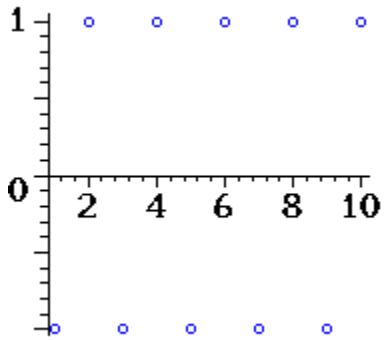
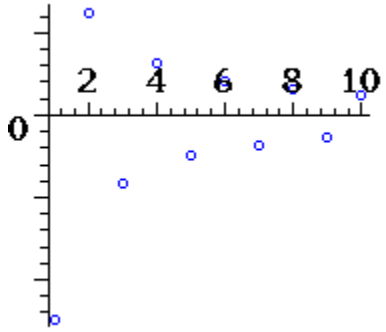


E)



69. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=2}^{\infty} \frac{\ln n}{n^8}$$

A) Converges
B) Diverges
C) Integral Test inconclusive

70. Find a power series for the function, centered at c, and determine the interval of convergence.

$f(x) = \dfrac{8}{6+x},\ c = 7$

A) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 8}{13^{n+1}}(x-7)^n,\ x \in (-1,13)$

B) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^{n+1} 8}{13^{n+1}}(x-7)^n,\ x \in (-6,20)$

C) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 8}{13^{n+1}}(x-7)^n,\ x \in (-6,20)$

D) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^{n+1} 8}{13^{n+1}}(x-7)^n,\ x \in (-1,13)$

E) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 8}{13^n}(x-7)^n,\ x \in (-1,13)$

71. Determine the convergence or divergence of the sequence with the given nth term. If the sequence converges, find its limit.

$a_n = \dfrac{\ln\left(\sqrt[5]{n}\right)}{6n}$

A) Sequence diverges to 0
B) Sequence diverges
C) Sequence converges to 1
D) Sequence converges to $\dfrac{1}{6}$
E) Sequence converges to 0

72. Find all values of x for which the series converges. For these values of x, write the sum of the series as a function of x.

$$\sum_{n=0}^{\infty} \frac{x^n}{3^n}$$

A) $\frac{3}{3-x}, -1 < x < 1$

B) $\frac{3}{3+x}, -3 < x < 3$

C) $\frac{3}{3-x}, -\frac{1}{3} < x < \frac{1}{3}$

D) $\frac{3}{3+x}, -\frac{1}{3} < x < \frac{1}{3}$

E) $\frac{3}{3-x}, -3 < x < 3$

73. Find the Maclaurin polynomial of degree 4 for the function.

$$f(x) = \cos(3x)$$

A) $1 + \frac{9}{2}x^2 - \frac{27}{8}x^4$

B) $1 - \frac{9}{2}x^2 + \frac{81}{40}x^4$

C) $1 - \frac{9}{2}x^2 + \frac{27}{8}x^4$

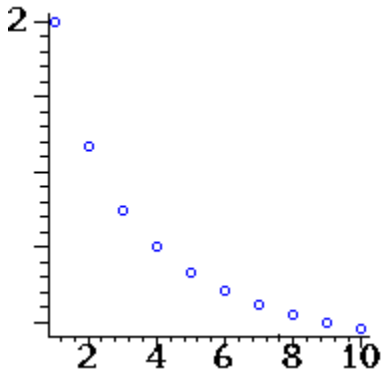
D) $1 + \frac{9}{2}x^2 - \frac{81}{40}x^4$

E) $x - \frac{9}{2}x^3 - \frac{81}{40}x^5$

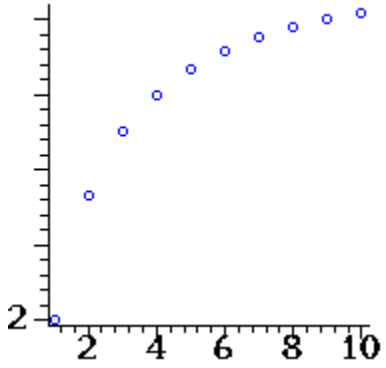
74. Match the sequence with its graph.

$a_n = \dfrac{4n}{n+1}$

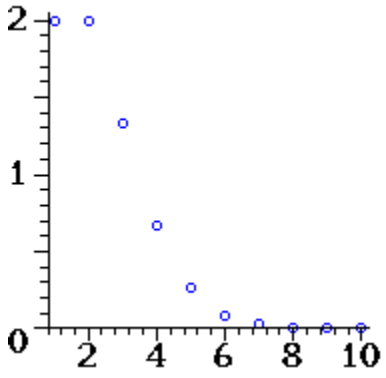
A)



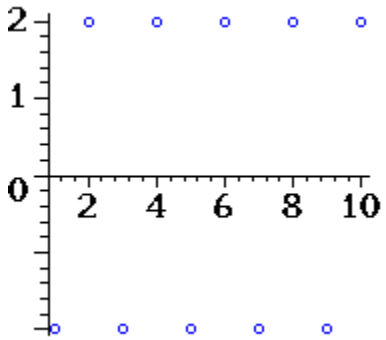
B)



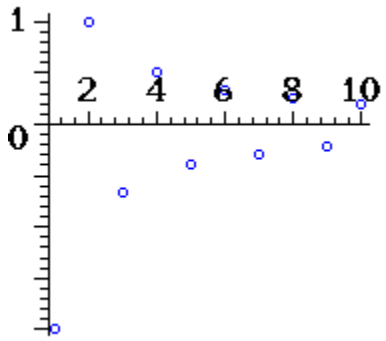
C)



D)



E)



75. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \frac{6}{8n+10}$$

A) Converges
B) Diverges
C) Integral Test inconclusive

76. Write the first five terms of the sequence of partial sums.

$$4-\frac{16}{3}+\frac{64}{9}-\frac{256}{27}+\frac{1024}{81}-\cdots$$

A) $4,-\frac{16}{3},\frac{64}{9},-\frac{256}{27},\frac{1024}{81},\ldots$

B) $4,\frac{4}{3},+\frac{52}{9},-\frac{100}{27},+\frac{724}{81}$

C) $4,\frac{4}{3},+\frac{52}{9},\frac{100}{27},+\frac{724}{81}$

D) $4,-\frac{4}{3},+\frac{52}{9},-\frac{100}{27},+\frac{724}{81}$

E) None of the above

77. Find the radius of convergence of the power series.

$$\sum_{n=0}^{\infty}\frac{(-1)^n x^n}{9^n}$$

A) $\frac{1}{9}$

B) 9

C) 81

D) $\frac{1}{81}$

E) ∞

78. Find the interval of convergence of the power series. (Be sure to include a check for convergence at the endpoints of the interval.)

$$\sum_{n=0}^{\infty}\left(\frac{x}{2}\right)^n$$

A) $[-2,2)$

B) $(-2,2)$

C) $[-2,2]$

D) $\left[-\frac{1}{2},\frac{1}{2}\right)$

E) $\left(-\frac{1}{2},\frac{1}{2}\right)$

79. Use the binomial series to find the Maclaurin series for the function.

$$f(x)=\frac{1}{\sqrt[9]{1-x}}$$

A) $1+\frac{1}{9}x+\frac{(1+9)}{2!9^2}x^2+\frac{(1+9)(1+2\cdot 9)}{3!9^3}x^3+\cdots$

B) $1-\frac{1}{9}x+\frac{(1+9)}{2!9^2}x^2-\frac{(1+9)(1+2\cdot 9)}{3!9^3}x^3+\cdots$

C) $1-\frac{1}{9}x-\frac{(1+9)}{2!9^2}x^2-\frac{(1+9)(1+2\cdot 9)}{3!9^3}x^3-\cdots$

D) $1+\frac{1}{9}x^2+\frac{(1+9)}{2!9^2}x^4+\frac{(1+9)(1+2\cdot 9)}{3!9^3}x^6+\cdots$

E) $1-\frac{1}{9}x^2-\frac{(1+9)}{2!9^2}x^4-\frac{(1+9)(1+2\cdot 9)}{3!9^3}x^6-\cdots$

80. The terms of a series $\sum_{n=1}^{\infty} a_n$ are defined recursively. Determine the convergence or divergence of the series. Explain your reasoning.

$$a_1=2, a_{n+1}=\frac{-6n+1}{4n-5}a_n$$

A) Converges; Alternating Series Test
B) Diverges; Integral Test
C) Converges; Roots Test
D) Diverges; Ratio Test
E) Both A and B
F) Both C and D

81. Convert the polar equation to rectangular form.

$$r=4$$

A) $x=4$
B) $x^2+(y-4)^2=16$
C) $x^2+y^2=16$
D) $5x-y+4=0$
E) $y=4$

82. Find a polar equation for the parabola with its focus at the pole, eccentricity $e = 1$, and directrix $y = -8$.

A) $r = \dfrac{8}{1+\sin\theta}$

B) $r = \dfrac{8}{1-\sin\theta}$

C) $r = -\dfrac{8}{1-\sin\theta}$

D) $r = -\dfrac{8}{1-\cos\theta}$

E) $r = \dfrac{8}{1+\cos\theta}$

83. Find an equation of the hyperbola with vertices (0,–5), (0,5) and asymptotes $y = \pm\dfrac{1}{3}x$.

A) $\dfrac{y^2}{5} + \dfrac{x^2}{15} = 1$

B) $\dfrac{y^2}{25} + \dfrac{x^2}{225} = 1$

C) $\dfrac{y^2}{15} - \dfrac{x^2}{5} = 1$

D) $\dfrac{y^2}{5} - \dfrac{x^2}{15} = 1$

E) $\dfrac{y^2}{25} - \dfrac{x^2}{225} = 1$

84. Classify the graph of the equation as a circle, a parabola, an ellipse, or a hyperbola.

$8x^2 + 8y^2 + 2x + 7y - 1 = 0$

A) Parabola
B) Circle
C) Ellipse
D) Hyperbola

85. Find the arc length of the curve on the given interval.

$x = t^2 + 9,\ y = 4t^3 + 2,\ -1 \le t \le 0$

A) $\dfrac{(50)^{\frac{3}{2}} - 8}{432}$

B) $\dfrac{(148)^{\frac{9}{4}} - 8}{432}$

C) $\dfrac{(148)^{\frac{9}{4}} - 8}{216}$

D) $\dfrac{(50)^{\frac{3}{2}} - 8}{216}$

E) None of the above

86. Find the center, foci, vertices, and eccentricity of the ellipse.

$\dfrac{(x-3)^2}{25} + \dfrac{(y+1)^2}{9} = 1$

A) Center: (3,–1); Vertices: (–2,–1) , (8,–1); Foci: (3,–5) , (7,3); Eccentricity: $\varepsilon = \dfrac{5}{4}$

B) Center: (3,–1); Vertices: (3,–6) , (3,4); Foci: (3,–5) , (3,3); Eccentricity: $\varepsilon = \dfrac{4}{5}$

C) Center: (3,–1); Vertices: (–2,–1) , (8,–1); Foci: (–1,–1) , (7,–1); Eccentricity: $\varepsilon = \dfrac{2}{5}$

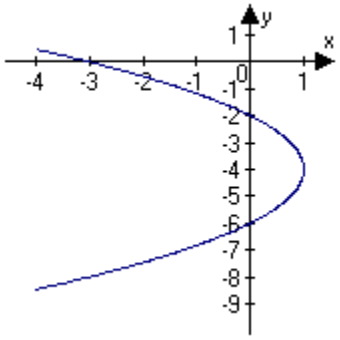
D) Center: (3,–1); Vertices: (–2,–1) , (8,–1); Foci: (–1,–1) , (7,–1); Eccentricity: $\varepsilon = \dfrac{5}{2}$

E) Center: (3,–1); Vertices: (–2,–1) , (8,–1); Foci: (–1,–1) , (7,–1); Eccentricity: $\varepsilon = \dfrac{4}{5}$

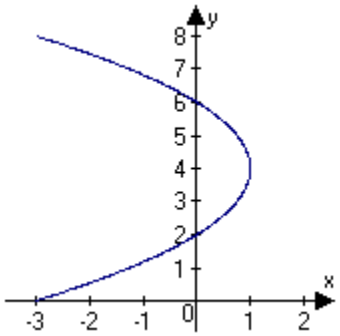
87. Find the vertex, focus, and directrix of the parabola and sketch its graph.

$y^2 + 8y + 4x + 12 = 0$

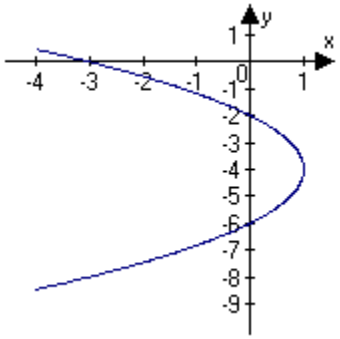
A) Vertex: (1,–4); Focus: (0,–4); Directrix $x = 2$



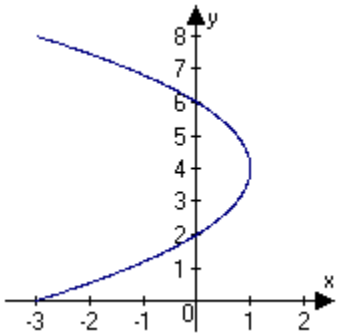
B) Vertex: (1,–4); Focus: (0,–4); Directrix $x = 2$



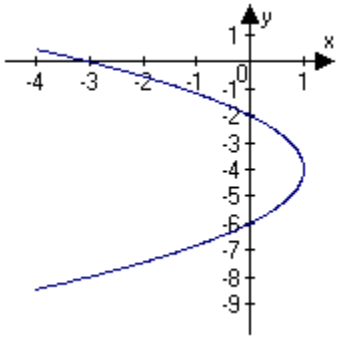
C) Vertex: (–1,4); Focus: (–2,–4); Directrix $x = 0$



D) Vertex: (–1,4); Focus: (–2,–4); Directrix $x = 0$



E) Vertex: (1,–4); Focus: (2,–4); Directrix $x = 0$



88. Find a polar equation for the ellipse with its focus at the pole, eccentricity $e = \frac{3}{4}$, and directrix $y = -2$.

A) $r = \dfrac{-6}{4 + 3\sin\theta}$

B) $r = \dfrac{6}{4 - 3\sin\theta}$

C) $r = \dfrac{-6}{4 + 3\cos\theta}$

D) $r = \dfrac{-6}{4 - 3\cos\theta}$

E) $r = \dfrac{6}{4 - 3\cos\theta}$

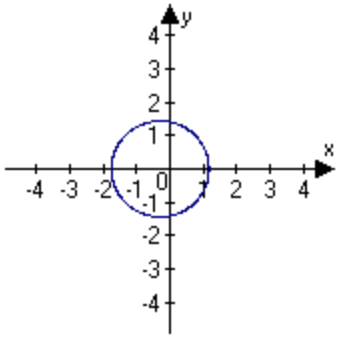
89. Find the eccentricity and distance from the pole to the directrix of the conic. Then sketch and identify the graph. Use a graphing utility to confirm your results.

$$r = \frac{7}{5 + \cos\theta}$$

A) Eccentricity: 5

Distance from pole to directrix: $\frac{1}{7}$

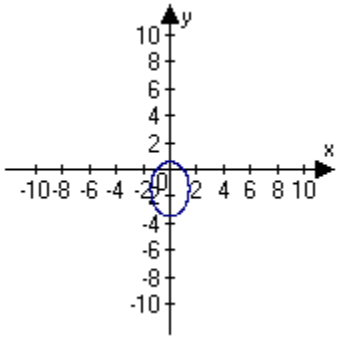
The graph is an ellipse.



B) Eccentricity: 5

Distance from pole to directrix: $\frac{1}{7}$

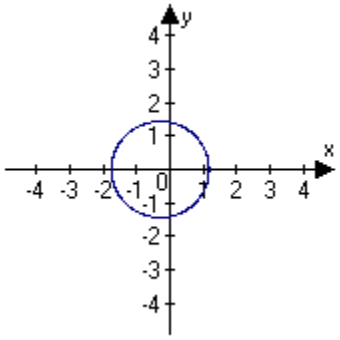
The graph is a hyperbola.



C) Eccentricity: $\frac{1}{5}$

Distance from pole to directrix: 7

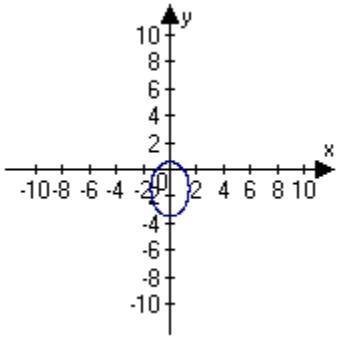
The graph is an ellipse.



D) Eccentricity: 5

Distance from pole to directrix: 7

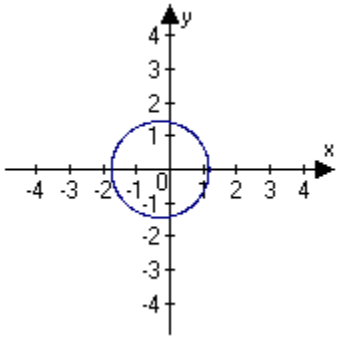
The graph is a hyperbola.



E) Eccentricity: $\frac{1}{5}$

Distance from pole to directrix: $\frac{1}{7}$

The graph is an ellipse.



90. Find the points of intersection of the graphs of the equations.

$r = 1 + \cos\theta$

$r = 3\cos\theta$

A) $\left(\frac{3}{2}, \frac{\pi}{3}\right), \left(\frac{3}{2}, -\frac{\pi}{3}\right), (0,0)$

B) $\left(\frac{3}{2}, \frac{\pi}{6}\right), \left(\frac{3}{2}, -\frac{\pi}{6}\right), (0,0)$

C) $\left(\frac{3\sqrt{3}}{2}, \frac{\pi}{3}\right), \left(\frac{3\sqrt{3}}{2}, -\frac{\pi}{3}\right), (0,0)$

D) $\left(\frac{3\sqrt{3}}{2}, \frac{\pi}{6}\right), \left(\frac{3\sqrt{3}}{2}, -\frac{\pi}{6}\right), (0,0)$

E) None of the above

91. Find the center, foci, and vertices of the hyperbola.

$\frac{(x-1)^2}{9} - \frac{(y+2)^2}{4} = 1$

A) Center: (1,–2); Vertices: (1,–4), (1,0); Foci: $\left(1, -2-\sqrt{13}\right), \left(1, -2+\sqrt{13}\right)$.

B) Center: (1,–2); Vertices: (–2,–2), (4,–2); Foci: $\left(1, -2-\sqrt{13}\right), \left(1, -2+\sqrt{13}\right)$.

C) Center: (1,–2); Vertices: (1,–4), (1,0); Foci: $\left(1, -2-\sqrt{13}\right), \left(1, -2+\sqrt{13}\right)$.

D) Center: (1,–2); Vertices: (–2,–2), (4,–2); Foci: $\left(1-\sqrt{13}, -2\right), \left(1+\sqrt{13}, -2\right)$.

E) Center: (1,–2); Vertices: (–2,–2), (–4,–2); Foci: $\left(1, -2-\sqrt{13}\right), \left(-1, -2+\sqrt{13}\right)$.

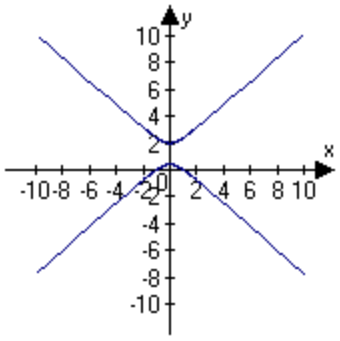
92. Find the eccentricity and distance from the pole to the directrix of the conic. Then sketch and identify the graph. Use a graphing utility to confirm your results.

$$r = \frac{2}{2 + 3\sin\theta}$$

A) Eccentricity: $\frac{3}{2}$

Distance from pole to directrix: $\frac{2}{3}$

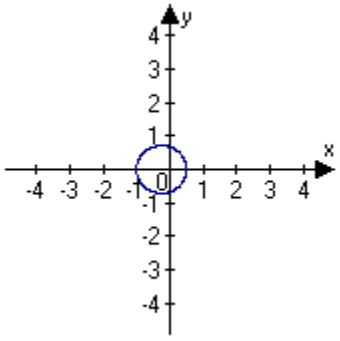
The graph is a hyperbola.



B) Eccentricity: $\frac{3}{2}$

Distance from pole to directrix: $\frac{2}{3}$

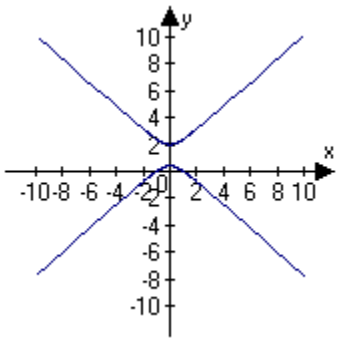
The graph is an ellipse.



C) Eccentricity: $\frac{2}{3}$

Distance from pole to directrix: $\frac{2}{3}$

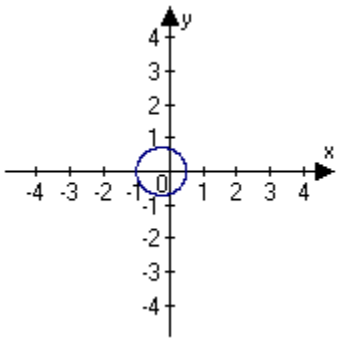
The graph is a hyperbola



D) Eccentricity: $\frac{2}{3}$

Distance from pole to directrix: $\frac{3}{2}$

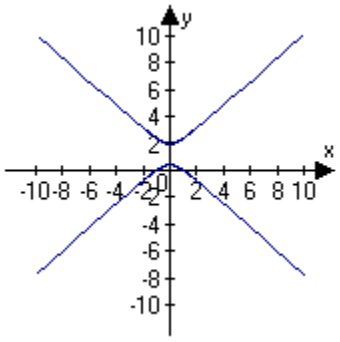
The graph is an ellipse.



E) Eccentricity: $\frac{2}{3}$

Distance from pole to directrix: $\frac{3}{2}$

The graph is a hyperbola.



93. Find a polar equation for the hyperbola with its focus at the pole, eccentricity $e = \frac{5}{4}$, and directrix $y = -9$.

A) $r = \frac{45}{4 + 5\cos\theta}$

B) $r = \frac{-45}{4 - 5\sin\theta}$

C) $r = \frac{45}{4 - 5\sin\theta}$

D) $r = \frac{-45}{4 + 5\cos\theta}$

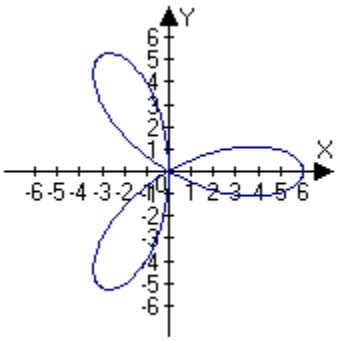
E) $r = \frac{-45}{4 + 5\sin\theta}$

94. Classify the graph of the equation as a circle, a parabola, an ellipse, or a hyperbola.

$y^2 + 3y + 5x - 10 = 0$

A) Parabola
B) Circle
C) Ellipse
D) Hyperbola

95. Match the graph with its polar equation.



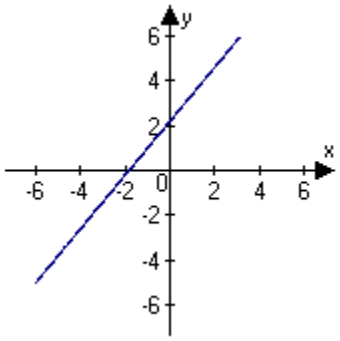
A) $r = 3\sin\theta$
B) $r = 6\cos(3\theta)$
C) $r = 4(1 + \cos\theta)$
D) $r = 3\sec\theta$
E) $r = 4(1 + \sin\theta)$

96. Sketch the curve represented by the parametric equations, and write the corresponding rectangular equation by eliminating the parameter.

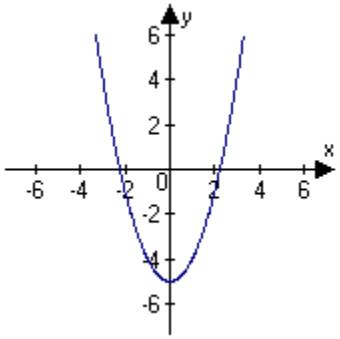
$x = 5\cos\theta$

$y = 9\sin\theta$

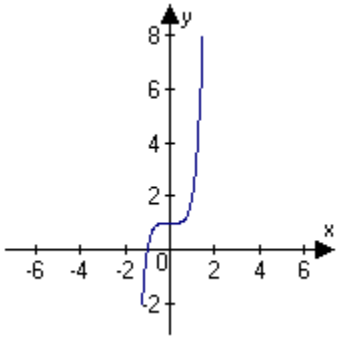
A) $y = \frac{6}{5}(x+1)+1$



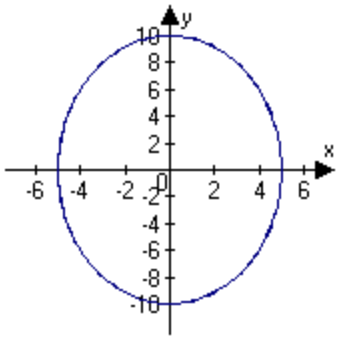
B) $y = x^2 - 5, x \geq 0$



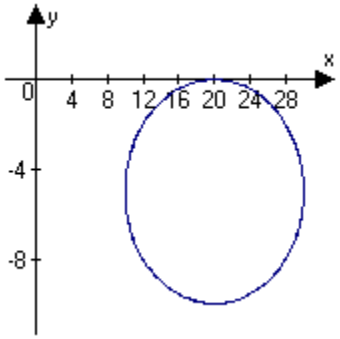
C) $y = x^5 + 1$



D) $\frac{x^2}{25}+\frac{y^2}{81}=1$



E) $y=\ln x$



97. Find an equation of the hyperbola with vertices (-2,0), (2,0) and asymptotes $y=\pm 3x$.

A) $\frac{x^2}{36}-\frac{y^2}{4}=1$

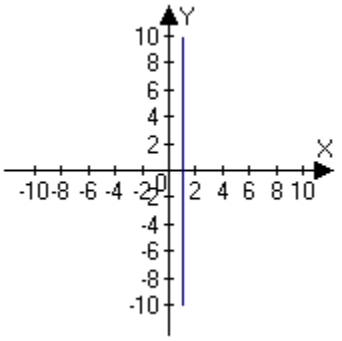
B) $\frac{x^2}{4}+\frac{y^2}{36}=1$

C) $\frac{x^2}{4}-\frac{y^2}{36}=1$

D) $\frac{x^2}{6}-\frac{y^2}{2}=1$

E) $\frac{x^2}{2}-\frac{y^2}{6}=1$

98. Match the graph with its polar equation.



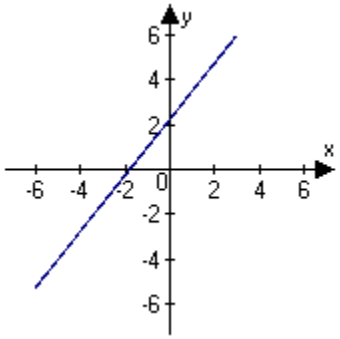
A) $r = 1\sin\theta$
B) $r = 2\cos(1\theta)$
C) $r = 2(1+\cos\theta)$
D) $r = 1\sec\theta$
E) $r = 2(1+\sin\theta)$

99. Sketch the curve represented by the parametric equations, and write the corresponding rectangular equation by eliminating the parameter.

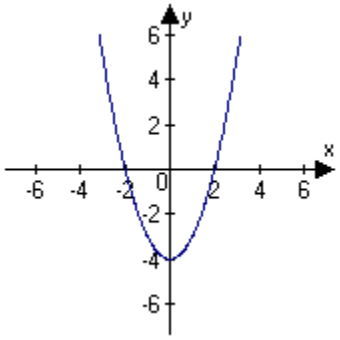
$x = \sqrt{t}$

$y = t - 4$

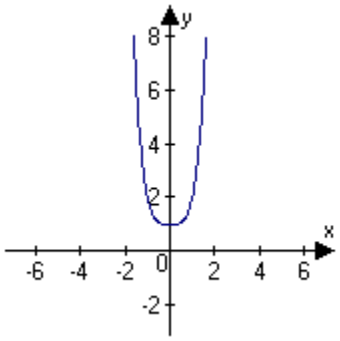
A) $y = \frac{5}{4}(x+1)+1$



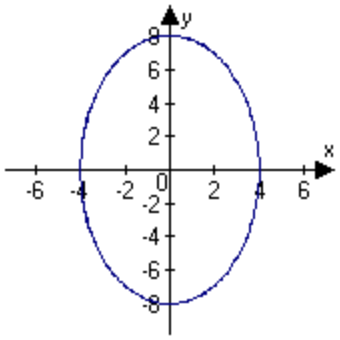
B) $y = x^2 - 4, x \geq 0$



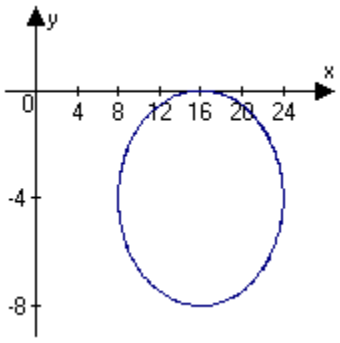
C) $y = x^4 + 1$



D) $\frac{x^2}{16}+\frac{y^2}{64}=1$



E) $y=\ln x$



100. Find the points of intersection of the graphs of the equations.

$r=\frac{\theta}{1.5}$

$r=1.5$

A) $(1.5, 2.25)$

B) $(-1.5, -2.25)$

C) $\left(\sqrt{1.5}, 1.5\right)$

D) $\left(\sqrt{1.5}, -1.5\right)$

E) A and B

F) C and D

Answer Key

1. C
2. B
3. A
4. A
5. B
6. E
7. D
8. C
9. A
10. B
11. D
12. B
13. A
14. E
15. D
16. B
17. B
18. B
19. A
20. A
21. A
22. B
23. C
24. B
25. E
26. C
27. E
28. C
29. D
30. C
31. B
32. A
33. D
34. C
35. D
36. C
37. A
38. D
39. D
40. E
41. A
42. A
43. E
44. A

45. B
46. C
47. D
48. B
49. E
50. C
51. D
52. D
53. D
54. A
55. B
56. A
57. E
58. B
59. D
60. C
61. C
62. A
63. B
64. C
65. B
66. D
67. C
68. D
69. A
70. C
71. E
72. E
73. C
74. B
75. B
76. D
77. B
78. B
79. A
80. D
81. C
82. B
83. E
84. B
85. E
86. E
87. A
88. B
89. C
90. A

91. D
92. A
93. C
94. A
95. B
96. D
97. C
98. D
99. B
100. E