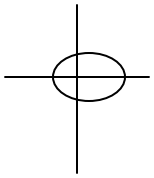
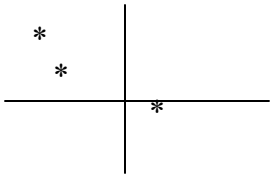
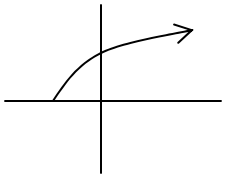
Math 1314
Review

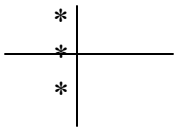
1. Remove an ordered pair of the following relation in order to obtain a function.
   {(1,2), (0,-3), (1, -5), (7, -3)}

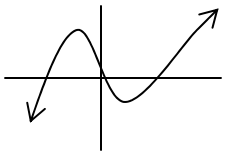
2. Determine whether each graph is of a function.

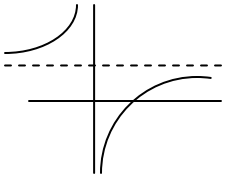
a.) 

b.) 

c.) 

d.) 

e.) 

f.) 

3. Which graph(s) in #2. are one-to-one functions?

4. Which graph(s) in #2. are of polynomial functions?

5. Given $f(x) = 2x^4 - 7x^3 + 3x^2 + 8x - 4$, find the following:

   a.) end behavior

   b.) List the possible rational zeros.
   c.) Use Descartes's Rule of signs to determine the possible number of positive and negative real zeros
   d.) Show that all the real zeros are bounded by –2 and 4.

   e.) Find the actual zeros of the function.

   f.) Graph *f*(*x*).

6. Find the domains of each function:

   a.) $f(x) = \dfrac{1}{3x+2}$

   b.) $f(x) = 4x^2 + 3x - 1$

   c.) $f(x) = \log_3(x+1)$

   d.) $f(x) = \sqrt{x-3}$

7. Evaluate: a.) $\log_9 81$ b.) $\log_8 1$ c.) $\log_7 5$ d.) $\log_4 16^{11}$

e.) $\log_7 \frac{1}{49}$ f.) $\log_{27} 3$ g.) $e^{\ln 3x}$ h.) $\ln e^{21}$

8 Using the graphs of $f(x)=x^2$, $g(x)=|x|$, $h(x)=\sqrt{x}$, and $m(x)=\log_2 x$, graph each of the following using transformation techniques. Give each domain and range.

a.) $r(x)=|x+1|-4$ b.) $s(x)=(x-3)^2+1$

c.) $k(x)=\log_2(x+1)$ d.) $c(x)=-\sqrt{x+2}+3$

9. Given $A=\begin{bmatrix} 3 & 4 \\ 6 & -1 \\ 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 0 \\ 2 & -3 \\ 1 & -1 \\ 2 & 4 \end{bmatrix}$, find 3A – 2B

10. Evaluate the determinants.

a.) $\begin{vmatrix} 4 & 3 \\ -1 & -2 \end{vmatrix}$ b.) $\begin{vmatrix} 1 & 0 & -1 \\ 2 & 3 & 4 \\ -1 & 0 & 6 \end{vmatrix}$

11. Write the first 4 terms of the sequence: $a_1=3,\ a_n=a_{n-1}+5,$ for $n \geq 2$.

12. Find the 13th term of the sequence: 1, 5, 25, …

13. Find the fourth term of the binomial expansion of $(2x+3y)^8$.

14. Expand the binomial: $(3x-5)^5$

15. Evaluate: a.) $\sum_{n=1}^{6} 5^n$ b) $\sum_{n=1}^{10} 2n+3$ c) $\sum_{k=1}^{\infty} 4\left(\frac{1}{2}\right)^k$

16. Find the asymptotes, if any, of the rational functions:

a.) $f(x)=\frac{2x^2}{x^2-1}$ b.) $f(x)=\frac{x^2+5x+8}{x+3}$

17. a.) Find the final amount earned on an investment of $3000 compounded quarterly for 2 years at 10% interest.

b.) Find the final amount earned on an investment of $3000 compounded continuously for 2 years at 10% interest.

18. Condense into a single logarithm: $\log_5(x+1)+\log_5(x-1)-\log_5(x+3)$

19. Solve: $7e^{3x}=456$

20. Solve: $\log(x+1)+\log x=\log 6$

21. Find AB if $A=\begin{bmatrix}3 & 2\\ 0 & 1\\ -1 & 1\end{bmatrix}$, $B=\begin{bmatrix}4 & 6\\ 1 & 0\end{bmatrix}$

22. Write the linear system as a matrix equation in the form AX = B, then solve the system using the inverse of the coefficient matrix.

$$\begin{cases}x+2y+3z=-5\\ x+y+z=-1\\ x-2z=3\end{cases} \text{ and the inverse of } \begin{bmatrix}1 & 2 & 3\\ 1 & 1 & 1\\ 1 & 0 & -2\end{bmatrix} \text{ is } \begin{bmatrix}-2 & 4 & -1\\ 3 & -5 & 2\\ -1 & 2 & -1\end{bmatrix}$$

23. If $A=\begin{bmatrix}4 & 3\\ -7 & -5\end{bmatrix}$, find $A^{-1}$

24. Solve by Gaussian Elimination:

$$\begin{aligned}x-2y+z&=16\\ 2x-y-z&=14\\ 3x+5y-4z&=-10\end{aligned}$$

25. Find the inverse of the function: $f(x)=\sqrt[3]{x+4}$

26. If $f(x)=3x-5$ and $g(x)=x^2-1$ find the following:

a.) $(f+g)(6)$
b.) $(f\circ g)(x)$
c.) $\left(\frac{f}{g}\right)(2)$
d.) $(g\circ f)(4)$

27. Use Cramer's Rule to solve the system:

$$\begin{aligned}x-3y&=-18\\ -2x+y&=11\end{aligned}$$

28. Use the Remainder theorem to find $P(3)$ if $P(x) = 3x^5 - 2x^3 + x^2 + 4x - 6$

29. Given that $2i$ is a zero of $f(x) = x^4 - 3x^3 - 6x^2 - 12x - 40$, find the other zeros.

30. Find a 3rd degree polynomial function if it has zeros of $-5$ and $1+4i$; $f(1) = -96$

31. Graph: $f(x) = \dfrac{x^2 - x}{(x-2)^2}$

32. Find and simplify the difference quotient $\dfrac{f(x+h) - f(x)}{h}, h \neq 0$ for $f(x) = 3x^2$

33. Express the sum using summation notation with 1 as the lower limit of summation and i for the index. $1^4 + 2^5 + 3^6 + \cdots + 12^{15}$

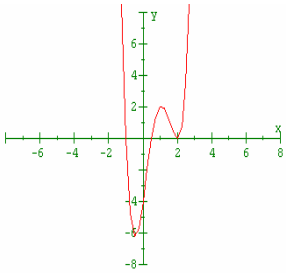
**Answers:**

1. either (1, 2) or (1, –5)

2. a.) no b.) yes c.) yes d.) no e.) yes f.) yes

3. b., c. and f. 4. e.

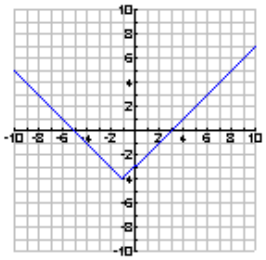
5. a.) left end rises, right end rises b.) ± ½ , ±1, ±2, ±4 c) 3 or 1 positive zeros; 1 negative zero
   d.) -2 division has a quotient of alternating signs, therefore –2 is a lower bound of the real zeros.
   4 division has a quotient of nonnegative signs, therefore 4 is an upper bound of the real zeros.
   e.) 2 multiplicity of 2; –1 ; ½ f.)




6. a.) $\left(-\infty, -\frac{2}{3}\right) \cup \left(-\frac{2}{3}, \infty\right)$ b.) $(-\infty, \infty)$ c.) $(-1, \infty)$ d.) $[3, \infty)$

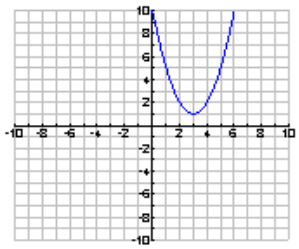
7. a.) 2 b.) 0 c.) 0.8271 d.)22 e.) –2 f.) 1/3 g.) 3x h.) 21

8. a.)



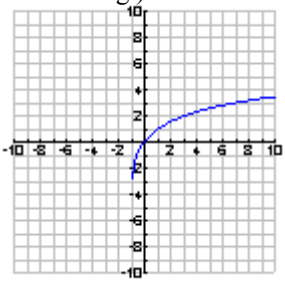
Domain $(-\infty, \infty)$ Range $[-4, \infty)$

b)

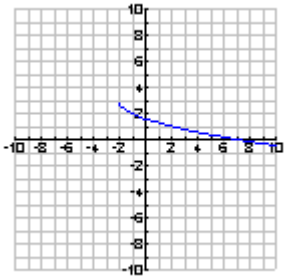


Dom: $(-\infty, \infty)$ Range $[1, \infty)$

c)



Dom $(-1, \infty)$ Range $(-\infty, \infty)$

8.d.) 

Dom $[-2, \infty)$ Range: $(-\infty, 3]$

9. $\begin{bmatrix} 7 & 12 \\ 14 & 3 \\ 4 & 2 \\ -1 & 7 \end{bmatrix}$

10. a.) –5 b.) 15

11. 3, 8, 13, 18

12. 244,140,625

13. $48384x^5y^3$

14. $243x^5 - 2025x^4 + 6750x^3 - 11250x^2 + 9375x - 3125$

15. a) 19,530 b) 140 c) 4

16. a.) vert asy: x = 1, x = – 1 horiz asy: y = 2 b.) vert. asy: x = – 3 slant asy: y = x + 2

17. a) $3655.21 b) $3664.21

18. $\log_5 \dfrac{(x^2-1)}{x+3}$

19. $\dfrac{\ln(456/7)}{3} \approx 1.392$

20. 2

21. $\begin{bmatrix} 14 & 18 \\ 1 & 0 \\ -3 & -6 \end{bmatrix}$

22. $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ 1 & 0 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 \\ -1 \\ 3 \end{bmatrix}$ ; (3, –4, 0)

23. $\begin{bmatrix} -5 & -3 \\ 7 & 4 \end{bmatrix}$

24. (6, –4, 2)

25. $f^{-1}(x) = x^3 - 4$

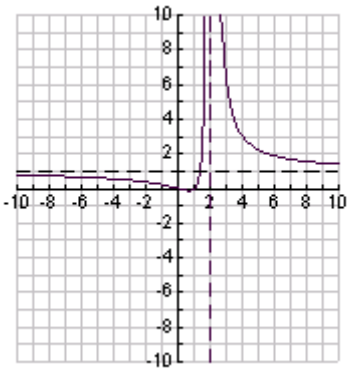
26.a.) 48 b.) $3x^2 - 8$ c.) 1/3 d.) 48

27. (–3, 5) where D = –5, $D_x$ = 15 and $D_y$ = – 25

28. The remainder with synthetic division is 690. Thus, P(3) = 690

29. other zeros are 5, –2, $-2i$

30. $f(x) = -x^3 - 3x^2 - 7x - 85$

31. 

32. $3(2x + h)$

33. $\sum_{i=1}^{12} i^{i+3}$