Math 1325
Review for Sections 9.7 – 9.9 and 10.1 - 10.3

1. If $f(x)=\dfrac{(x+5)^5}{(x+4)^3}$ find $f'(x)$. (Do not simplify your answer)

2. If $f(x)=\sqrt{\dfrac{x+1}{x}}$, find $f'(x)$. (Do no simplify your answer, but no negative exponents)

3. What is the rate of change of $f=x^2(x-5)^3$ when x = 3?

4. A company's profit (in thousands of dollars) for producing q units is given by $P=q\sqrt{500q-q^2}$. Find the marginal profit when 100 units are produced. Interpret the result.

5. Find $\dfrac{d^2y}{dx^2}$ if $y=\dfrac{x+3}{x-1}$.

6. Find $f^{(3)}(x)$ if $f(x)=3x^4-\sqrt{x}$.

7. Suppose the cost function for a certain product is given by $C(x)=100x+3x^2+.1x^3$ and the revenue function is $R(x)=30x^2-.9x^3$. Find the rate of change of the marginal profit when the level of production is 3 units.

8. The demand equation for a certain product in a monopoly market is $P=1296-.12x^2$, where x is the number of units and p is the price per unit. The cost function is $C(x)=830+396x$. Find the marginal profit when x = 30 units, and interpret the results.

9. Find the critical points and graph $f(x)=3x^5-5x^3$.

10. Find the critical points for $y=(9-x^2)^{3/5}$ and classify them as relative max, relative min, or any inflection points.

11. Suppose the total revenue is given by $R(x)=100x$ and the total cost is given by $C(x)=x^3-3x^2+2x$, where x is the number of units produced and sold. Find the relative maximum point for the profit function.

12. Find all the inflection points for $y=\dfrac{9x}{x^2+3}$.

13. Find the relative max, relative, min, and points of inflection and sketch the graph of $y = 1 + 2x^2 - \frac{1}{4}x^4$.

14. Suppose the total number of VCRs assembled by a machine in t hours is given by $P = t^3 - \frac{768}{t} + 200$. Find the point of diminishing returns (the point where the rate or production is maximized).

15. Find the absolute maximum and the absolute minimum points for $f(x) = x^3 + 3x^2 - 9x - 7$ on the interval [-4, 2].

16. Find the level of production that will minimize the <u>average</u> cost if the total cost of producing x units is given by $C(x) = 10{,}000 + 5x + \frac{1}{9}x^2$.

17. A company manufactures and sales x transistors per week. If the weekly cost is $C(x) = 5000 + 2x$ and the weekly demand is $p = 10 - \frac{x}{1000}$, where p is the price per unit in dollars, find the production level that maximizes profit, the maximum profit, and the price the company should charge for each transistor.

18. A cable company has 5000 customers paying $20 per month and has determined that it will lose 200 customers for each $1 it raises its price. How much should be charged to maximize revenue?

Answer Sheet

1. $\dfrac{(x+4)^3 \cdot 5(x+5)^4 - (x+5)^5 \cdot 3(x+4)^2}{(x+4)^6}$

2. $\dfrac{1}{2\left(1+\frac{1}{x}\right)^{\frac{1}{2}}} \cdot \left(-\dfrac{1}{x^2}\right)$

3. 60

4. The profit will increase by $275,000 if one additional unit over 100 is produced.

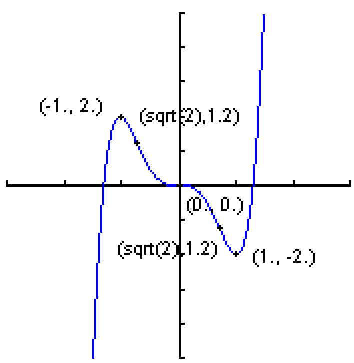
5. $\dfrac{8}{(x-1)^3}$

6. $72x - \dfrac{3}{8x^{\frac{5}{2}}}$

7. $35

8. $576, Profit will increase by $ 576 by selling the 31st unit.

9. (-1, 2) rel. max. & (1, -2) rel. min. (0, 0) inflection points $\left(-\frac{1}{\sqrt{2}}, 1.2\right)\left(\frac{1}{\sqrt{2}}, -1.2\right)$



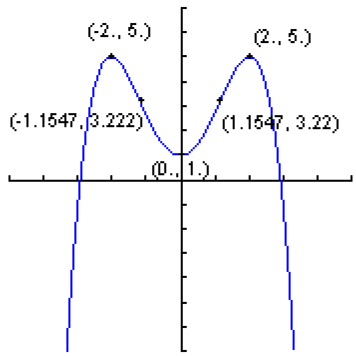
10. (-3, 0) inflection point, (3, 0) inflection point, (0, 3.373) rel. max.

11. (6.8, $490.69)

12. (-3, -2.25) (0, 0) (3, 2.25)

13. (-2, 5) (2, 5) rel. max. (0, 1) rel. min.

(-1.1547, 3.222) & (1.1547, 3.222) are points of inflection



14. t = 4, P = 72
15. abs max (-3, 20) abs. min. (1, -12)
16. x = 300
17. x = 4000 max profit $11,000 price = $6 each
18. $22.50