Week in Review # 6

MATH 142 — Drost-Spring 2010

Section 4.4-5.1,& review — Feb 28, 2010

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1. Given $h(x) = (f \circ g)(x)$, find possible functions for $f(x)$ and $g(x)$ when

   a. $h(x) = 6(3x-2)^4 + 4(3x-2)^2 + 9$

   b. $h(x) = \dfrac{5}{(x+1)^2} + 4x + 7$

Find the derivative of each of the following functions. (#2-#9)

2. $f(x) = (3x^2 - 10)^4$

3. $g(x) = (x^2 + 3x)^2(2x+1)^3$

4. $h(x) = \dfrac{x^2 + x + 5}{6x^2 + 30}$

5. $f(x) = 5\pi^2 - 2\ln x + e^{2x}$

6. $g(x) = 8^{x^2+1}$

7. $h(x) = \log(3x^2 - 4x + 9)$

8. $y = \ln\left\{(2x^3 - 5)^3 \cdot e^{x^2}\right\}$

9. $h(x) = \ln\left(\dfrac{x^2 + 1}{x^2 + 4}\right)$

10. Given the demand function $20p + x = 800$,

a. Find the elasticity of demand, $E(p)$.

b. Find $E(15)$ and determine if the price should be raised, lowered or left the same.

c. If the $15 price changes by 10%, how will the demand be changed?

d. What price maximizes revenue?

11. The price-demand equation for a gallon of gasoline is $x + 2,000p = 10,000$. Currently, the price of a gallon of gasoline is \$2.80/gallon. Will a 10% decrease in the price cause the revenue to increase or decrease?

12. Where is the function, $f(x) = \dfrac{x+5}{2x}$, increasing or decreasing?

13. The concentration of pain killer in the blood stream t hours after taking the medicine is given by $C(t) = \dfrac{(t-9)^2}{t^2 - 4t + 10}$, where $C(t)$ is measured in mg/ml. How many minutes before the pain killer has reached it's maximum concentration?

14. Find the intervals over which $f(x)$ is increasing when $f(x) = \dfrac{x-6}{x^2+x-6}$

15. Find the equation of the tangent to the curve $f(x) = (4\sqrt{x} - 9)^3$ at $x = 9$.

16. Plasma Plus determines that the price-demand function for their newest 27" screen is $p(x) = \dfrac{-x}{400} + 500$, where x represents the number of screens produced and sold. They have fixed costs of \$1797.75 and it cost the company \$495 to make each screen.

a. Find the revenue function, $R(x)$, and the cost function, $C(x)$.

b. Find the profit function, $P(x)$ and find the smallest and largest production levels x so that the company realizes a profit.

c. Evaluate $P'(500)$ and interpret.

d. How many should they make and sell to maximize profits?

17. Find the critical values for

a. $f(x) = -x^3 - 3x^2 + 24x$

b. $g(x) = \sqrt{3x - 12}$

18. Total costs to care for 12 dogs at the Puppy Palace Day Care is \$246. Food and treats run \$8 per dog. If the price-demand function is $p = -\frac{1}{20}x + 25$, find the number of dogs they should care for, to maximize profit.

19. Fuel Cells INC has a price-demand function, $x = 75 - .2p$, with fixed costs of \$4600 and each fuel cell costs \$60 to make. x represents the number of fuel cells made and sold.

a. Find the domain of the price-demand function.

b. Find the marginal cost function.

c. Find the revenue function and its domain.

d. Find the break even points.

e. Find the number of fuel cells they should make and sell to maximize profits.

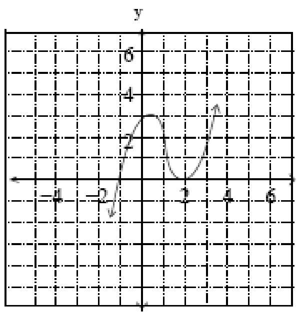
20. From the graph below of $f'(x)$,

a. Where is $f''(x) > 0$?

b. Where is $f(x)$ increasing?

c. Where does $f(x)$ have a relative max or min?

d. Where does $f'(x)$ have a point of inflection?



21. Find the equation of the tangent to the curve $f(x) = x^2 \cdot \ln x$ at $x = e$.

22. Find the derivative of

$$f(x) = 5^x \cdot \ln(x^2 + 10)$$

23. Find the derivative of

$$g(x) = \frac{e^{\sqrt{x}}}{\log_x(x^2 + 5x)}$$

DO NOT SIMPLIFY.

24. Find the derivative and DO NOT SIMPLIFY:

$$f(x) = \frac{x^7 - \ln x^3}{e^{5x}}$$

25. Find the derivative of $f(x) = x^x$.