Math 142 Week In Review
Problem Set #7
Review for Exam 2 (3.4, 3.5, 3.7, 4.1-4.4, 4.7, 5.1, 5.2)
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1. Given the price-demand equation $p + 0.001x = 50$,
   a. Express the demand x as a function of the price p.
   b. Find the elasticity of demand, $E(p)$.
   c. What is the elasticity of demand when $p = \$10$? If this price is increase by 10%, what is the approximate change in demand?
   d. What is the elasticity of demand when $p = \$25$? If this price is increase by 10%, what is the approximate change in demand?
   e. What is the elasticity of demand when $p = \$15$? If this price is increase by 10%, what is the approximate change in demand?

2. A model for the number of robberies in the United States (see table below) is $r(t) = 11.3 - 3.6\ln(t)$ where t is years since 1990. Find the relative rate of change for robberies in 2001.

year	1995	1996	1997	1998	1999	2000	2001	2002
Number of Robbery victims per 1000 population age 12 and over	5.4	5.4	4.3	4.0	3.6	3.2	2.8	2.2

3. Find the derivatives of the following functions. (DNS = Do not simplify)

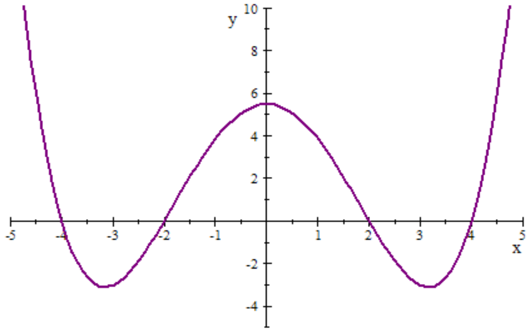
a. $f(x)=\dfrac{(4x^3+2x^2+5)^6}{\sqrt{2x+4}}$

b. $g(x)=\log_5\left(\sqrt{4x^2+3x-1}\right)\bullet 7^{3x+6}$ (DNS)

c. $h(x)=e^{2x^3+7x}\ln(3x^{2/3}-x^{1/4})$

4. Find the intervals where $f(x) = \frac{1}{4}x^2e^x$ increases and decreases.

5. The following graph represents the first derivative of a function. Use the graph to approximate the *x* values where the function has relative maximums and minimums and the *x* values where the function has point(s) of inflection.



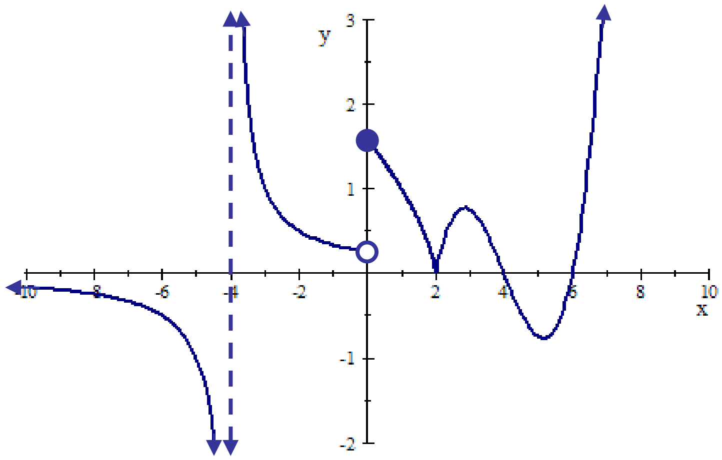
6. If $h(x) = \dfrac{\ln(x)}{f(x)}$, and $f(5) = 4$ and $f\,`(5) = -2$,

a) Find $h\,`(5)$.

b) Find the equation of the line tangent to $h(x)$ at $x = 3$.

7. Sketch a graph of a function that satisfies the following conditions.
   - $f(-2) = 1$, $f(0) = 2$
   - $f`(x) > 0$ on $(-2, 0)$
   - $f` (x) < 0$ on $(-\infty, -2)$ and $(0, \infty)$
   - $f``(x) > 0$ on $(-\infty, -1)$ and $(1, \infty)$
   - $f``(x) < 0$ on $(-1, 1)$
   - $\lim_{x\to\infty} f(x) = 0$, $\lim_{x\to-\infty} f(x) = \infty$

8. Use the graph of *f*(*x*) below to answer the questions that follow.



a. Identify the intervals on which *f* (*x*) is increasing.
b. Identify the intervals on which *f* (*x*) is decreasing.
c. Identify the intervals on which *f* ` (*x*) < 0.
d. Identify the intervals on which *f* ` (*x*) > 0.
e. Identify the *x* coordinates of the points where *f* ` (*x*) does not exist.
f. Identify the *x* coordinates of the point(s) where *f* (*x*) has a local maximum.
g. Identify the *x* coordinates of the point(s) where *f* (*x*) has a local minimum.

9. Suppose the function $R(x) = 50x - 4x^{3/2}$ represents the revenue function for a company, in thousands of dollars, when selling x hundred items.

a. Find the average rate of change in the company's revenue (to the nearest dollar) when sales change from 750 items to 1550 items.

b. Find the marginal average revenue function.

10. Use the limit definition of the derivative to find the derivative of $f(x) = \dfrac{1}{x+1}$.

11. Given $f'(x) = 3x^2 - 3$ use derivative techniques to find

a. the intervals where $f(x)$ is increasing and decreasing.
b. relative extrema of $f(x)$.
c. the intervals where $f(x)$ is concave up and concave down.
d. all points of inflection.

12. If $P(x) = 100x - x^2 - 500$ represents the profit function of a company, where x represents the number of items produced and sold and $P(x)$ is the profit in hundreds of dollars

a. Find the marginal profit function.
b. Find the approximate profit obtained from producing the 31st item.
c. Suppose the company's production level is currently 55 items and they are thinking of increasing the production level to 56 items. Would this be a "wise" move for the company to make? Why or why not?

13. How long will it take money to double if it is invested at 5% interest compounded continuously?

14. In a computer assembly plant a new employee, on average, is able to assemble $N(t) = 10(1 - e^{-0.4t})$ units after t days of on-the-job training.

a. What is the rate of learning after 1 day? After 5 days?
b. Find the number of days (to the nearest day) after which the rate of learning is less than 0.25 unit per day.