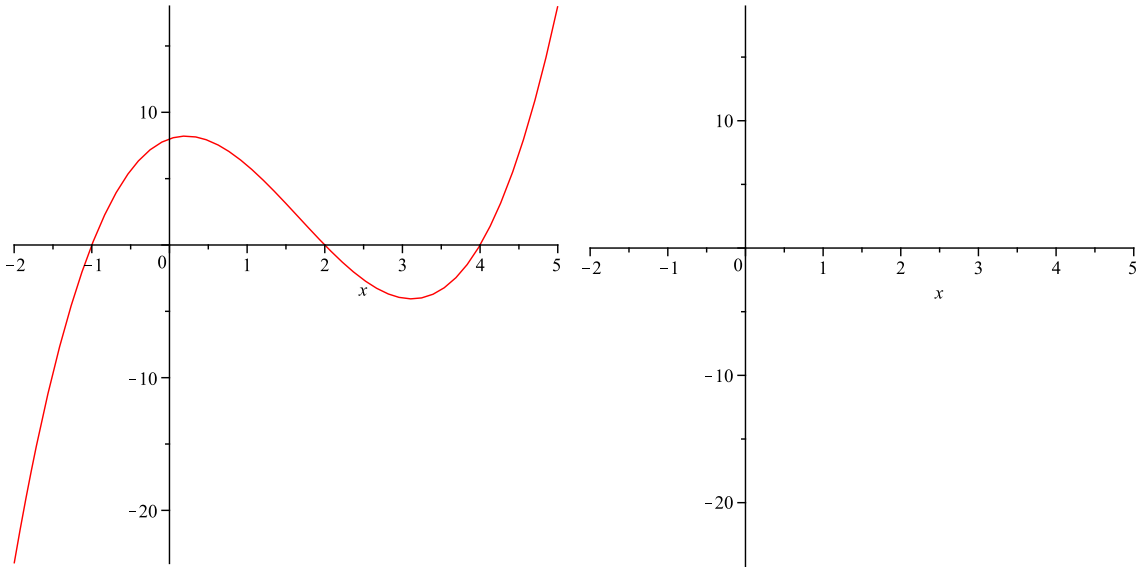
Name:_____

Math M119 Section 22611 *Practice Exam 1* *February 1, 2010*

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work or answer, you will receive little or no credit!

1. The amount $P(t)$ of diamonddillium remaining after t days be expressed by the formula $P(t) = P_0 e^{kt}$ where P_0 is the initial quantity. If the half-life of the diamonddillium is 8 days, determine the continuous decay rate k up to four decimal places.

2. Given the graph below $f(x)$, sketch its first derivative, $f'(x)$.

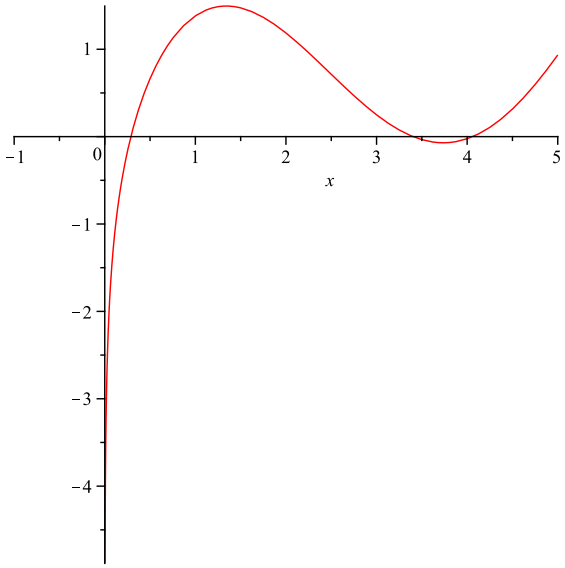


3. A company's pricing schedule is given in the following table:

q(number of units)	1	3	5	7
p(price per unit)	12	10	8	6

(a) Does this table represent a linear function, exponential function, or neither? **(b)** Write a formula which expresses p as a function of q.

4. Given the following graph of $f(x)$



Find all intervals where **(a)** $f'(x) > 0$ **(b)** $f'(x) < 0$ **(c)** $f''(x) > 0$ **(d)** $f''(x) < 0$.

5. Suppose $f(x)$ is a function $f(40) = 4000$ and $f'(40) = 7$. Estimate $f(41)$.

6. Solve the following equation for t using natural logarithms. $3(1.54)^{4t} - 7 = 0$

7. Production costs for manufacturing running shoes consists of a fixed overhead of $\$650,000$ plus variable costs of \$20 per pair of shoes. Each shoe sells for \$70. **(a)** Find the total cost, $C(q)$, the total revenue, $R(q)$, and the total profit function, $\pi(q)$, as a function of the number of pairs of shoes produced, q. **(b)** How many pairs of shoes must be produced and sold for the company to a make a profit?

For problems 8-10, find the average rates of change over the indicated interval.

8. $f(x) = x^3 + 2x + 1$, on the interval $(-1, 2)$

9. $f(x) = 3e^x$, on the interval $(0, 1)$

10. $f(x) = xe^x$, on the interval $(0, 2)$

11. Given the function $f(x) = \ln(x)$, estimate $f'(1)$.

12. Given $f(x) = x^2$, compute the difference quotient $\dfrac{f(x) - f(a)}{x - a}$, simplify it and evaluate the new expression at $x = a$.