

MIDTERM 1

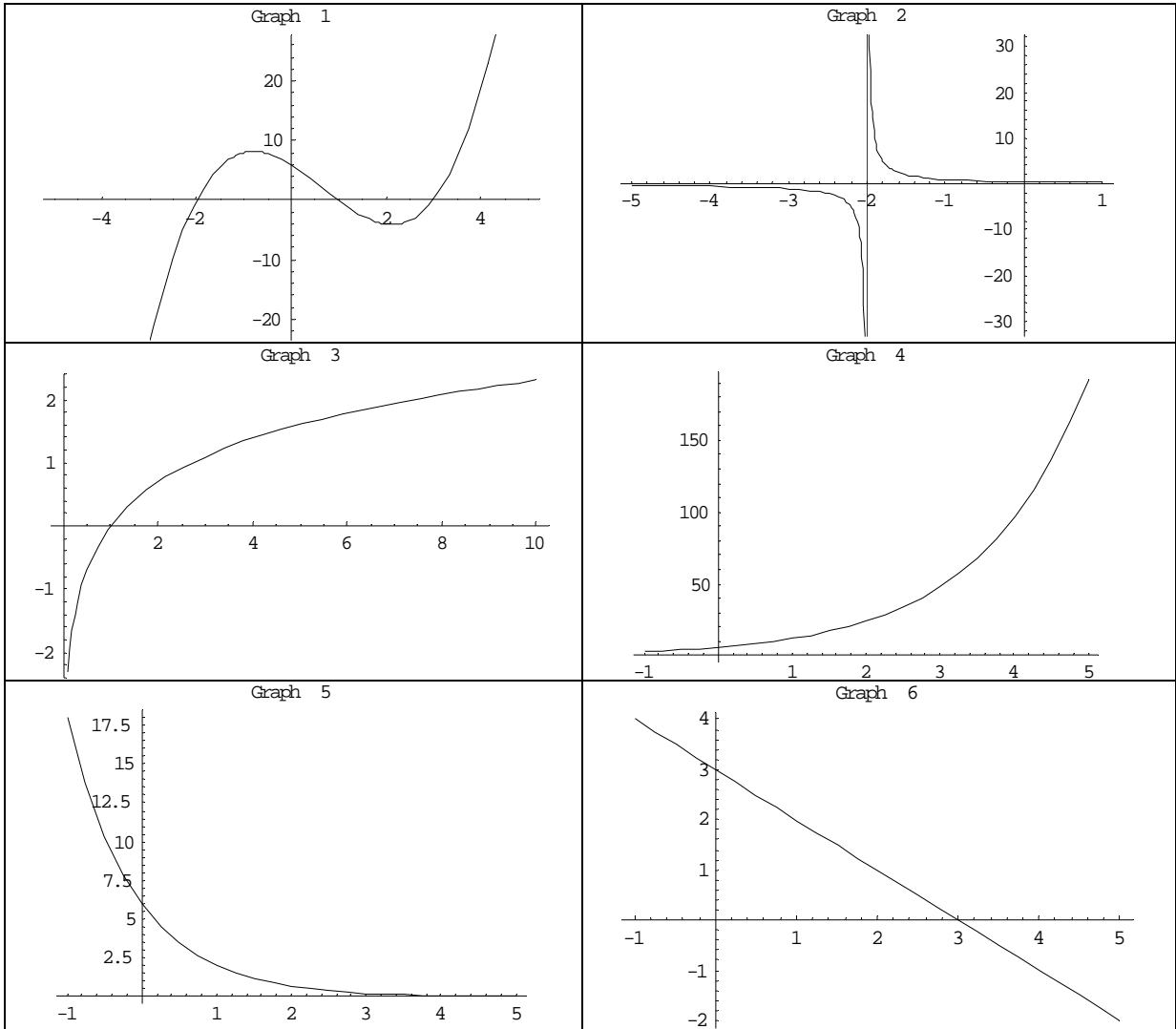
FALL 2007

September, 2007

Show your work, the right solution without explanation is useless. Be clean and organized, it is your responsibility to make yourself understood. No graphic calculators. If you did not bring your calculator, you will have to do the exam without it, sharing calculators is not allowed. Good luck!!!

Question	Points	Out of
1		12
2		10
3		10
4		10
5		12
6		12
7		12
8		12
9		10
Total		100

1. Match each of the following functions with its equations



- a. (2 points) $f(x) = 6 \cdot (2)^x$.
- b. (2 points) $g(x) = 3 - \ln(e^x)$
- c. (2 points) $h(x) = \ln x$
- d. (2 points) $i(x) = (x + 2)(x - 1)(x - 3)$
- e. (2 points) $j(x) = 6 \cdot (3)^{-x}$
- f. (2 points) $k(x) = \frac{1}{(x + 2)}$

2. Solve for t using natural logarithms.

a. (5 points) $7 = 8e^{-5t}$

Answer: _____

b. (5 points) $6.8^t = 5.9^t$

Answer: _____

3. You want to invest money for your child's education in a certificate of deposit (CD). You want it to be worth \$15,000 in 12 years. How much should you invest if the CD pays interest at a 8% annual rate compounded

a. (5 points) Annually?

Answer: _____

b. (5 points) Continuously?

Answer: _____

4. The cost, C , in dollars, to produce g gallons of ice cream can be expressed as $C = f(g)$. Decide if the following statements are True or False. Circle one.
- a. (2 points) If $f(150) = 200$, we can say that it will cost \$200 to produce 150 gallons of ice cream.
TRUE **FALSE**
- b. (2 points) The units of $f'(g)$ are $\frac{\text{gallons}}{\text{dollar}}$.
TRUE **FALSE**
- c. (2 points) If $f'(150) = 4$, we can say that it will cost \$150 to produce the fifth gallon of ice cream, provided that the ratio stays constant.
TRUE **FALSE**
- d. (2 points) We expect the cost to produce g gallons to increase as the number of gallons increase, and therefore we expect $f'(g)$ to be increasing.
TRUE **FALSE**
- e. (2 points) We expect the cost to produce g gallons to increase as the number of gallons increase, and therefore we expect $f'(g)$ to be positive.
TRUE **FALSE**
5. Find the derivative of the following functions:
- a. (4 points) $f(x) = 3x^6 - 2x^2 + 3$.

Answer: _____

b. (4 points) $g(x) = \frac{3}{x^6} - 2\sqrt[4]{x^3}$.

Answer: _____

c. (4 points) $h(x) = x^\pi + \frac{e^2}{\sqrt{x}}$.

Answer: _____

6. Let $f(x) = 3x^3 - 20x + 5$

- a. (2 points) What is the average rate of change of $f(x)$ between $x = 2$ and $x = 3$.

Answer: _____

- b. (3 points) Estimate $f'(2)$ using $h = 0.03$.

Answer: _____

- c. (2 points) Find the exact value of $f'(2)$.

Answer: _____

- d. (3 points) Use the result of part (b) to find the tangent line to the curve of $f(x)$ at the point $x = 2$.

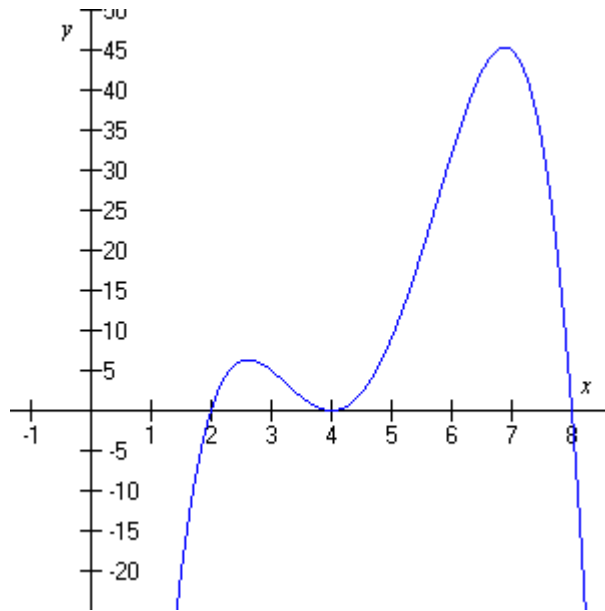
Answer: _____

- e. (2 points) Use the result of part (c) to estimate the value of $f(1.99)$.

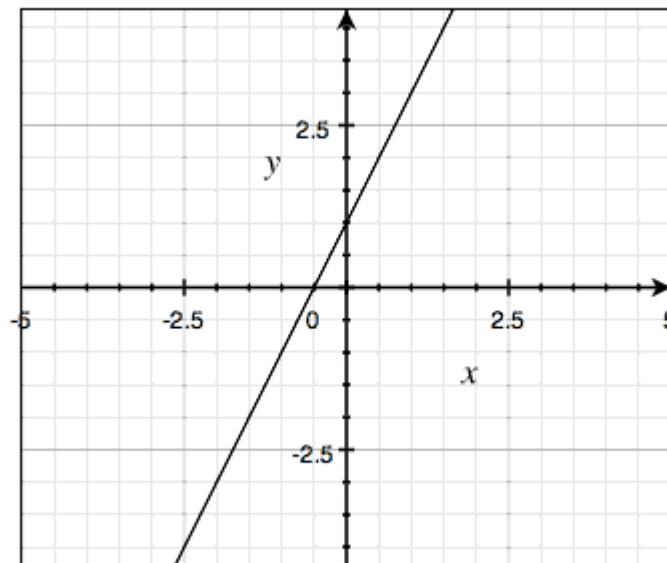
Answer: _____

7. Given the graphs below:

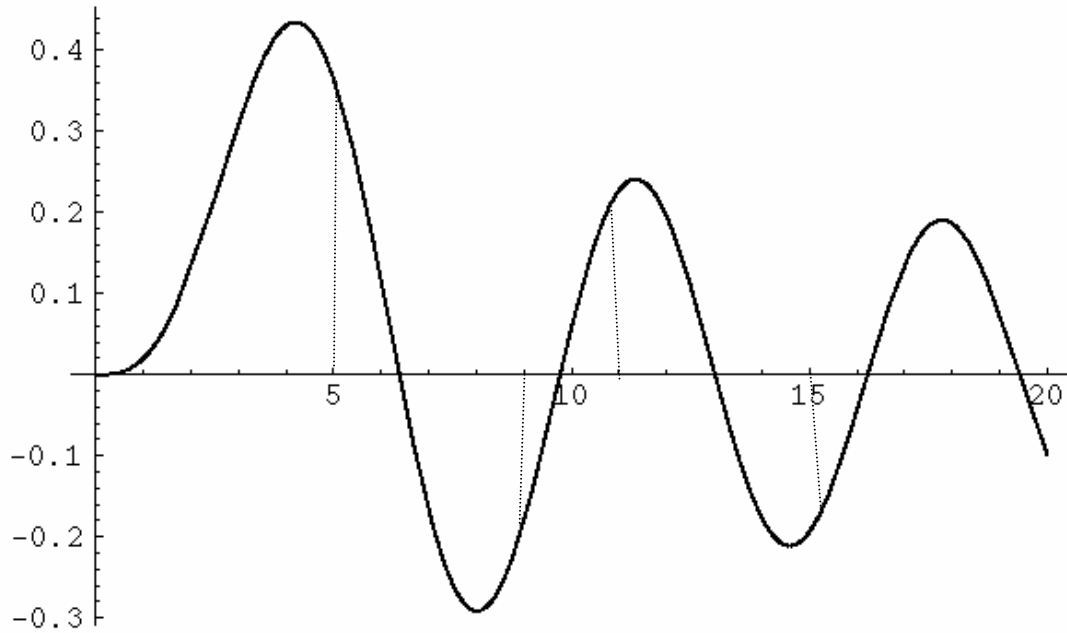
a. (6 points) Graph a possible derivative function in the same axis:



b. (6 points) Graph the **exact** derivative function in the same axis:



8. Given the graph of graph of $f(x)$ below, fill in the table indicating the sign of f' and f'' at each point.



	x	f'	f''
(3 points)	5		
(3 points)	9		
(3 points)	11		
(3 points)	15		

9. (10 points) Given all the of the following information about a function $f(x)$, sketch its graph in the given grid.

- $f(x)$ does not have any sharp corner.
- $f'(x) > 0$ for $x < -1$ and $1 < x < 3$.
- $f'(x) < 0$ for $-1 < x < 1$ and $x > 3$
- $f'(x) = 0$ for $x = -1$, $x = 1$ and $x = 3$.
- $f''(x) > 0$ for $0 < x < 2$.
- $f''(x) < 0$ for $x < 0$ and $x > 2$.
- $f''(x) = 0$ for $x = 0$ and $x = 2$.

