

Math 77
Midterm 1

Name _____

Fall 2006

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!!!

1. Let $f(x) = x^2 - 1$ and $g(x) = x - 2$

(a) What is $f(g(x))$?

Answer: _____

(b) What is $g(f(x))$?

Answer: _____

(c) What is $f(f(x))$?

Answer: _____

2. Decide if the following functions could be linear, exponential or neither. If linear or exponential give the possible formula.

x	f(x)	g(x)	h(x)
0	3	3	3
1	3.3	3.3	3.3
2	3.65	3.6	3.63
3	3.98	3.9	3.993
4	4.1	4.2	4.3923

Answer: _____

3. Solve using logs:

(a) $6^x = 54$

Answer: _____

(b) $e^{7x} = 8$

Answer: _____

4. True or False? Circle one.

(a) If $f(x)$ is increasing near $x = 7$, then $f'(7)$ is negative.

TRUE **FALSE**

(b) If $f(x)$ is concave up at $x = 3$, then $f''(3)$ is negative.

TRUE **FALSE**

(c) If $f(x)$ is concave down at $x = 2$, then $f'(x)$ is increasing near $x = 2$.

TRUE **FALSE**

(d) The doubling time of a quantity that is increasing by a 5% a year is smaller than 15 years.

TRUE **FALSE**

5. Let $f(t) = 2t^2 - t$:

(a) What is the change in $f(t)$ between $t = 0$ and $t = 2$?

Answer: _____

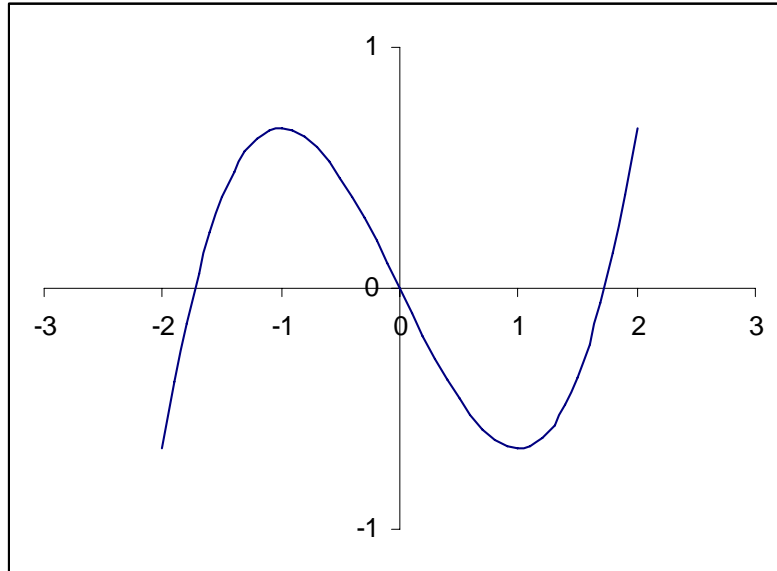
(b) What is the average rate of change in $f(t)$ between $t = 0$ and $t = 2$?

Answer: _____

(c) Give an estimation for $f'(0)$, using $h = 0.05$

Answer: _____

6. Below is the graph of a function $f(x)$. Sketch the graph of its derivative $f'(x)$ on the same axes:



7. Suppose $g(t)$ is the height in inches of a person who is t years old.

(a) Give a reasonable approximation for the following:

- $g(0)$

Answer: _____

- $g(30)$

Answer: _____

(b) Give the meaning, in plain English, of the equation $g(2) = 10$.

Answer: _____

(c) What is the meaning of $g'(40)$? (you are **not** supposed to give a reasonable approximation). Give units.

Answer: _____

8. Draw the graph of a function that satisfies the following conditions:

- $g'(x) > 0$ for all x
- $g''(x) > 0$ for $x < 2$
- $g''(x) < 0$ for $x > 2$

9. A population is growing according to the function $P(t) = 250(1.065)^t$, where $P(t)$ is the population at year t .

(a) What is the initial population?

Answer: _____

(b) What is the annual growth rate?

Answer: _____

(c) What is the population in year 10?

Answer: _____

(d) How many years will it take for the population to reach 1000?

Answer: _____

10. Consider the function $f(x) = 6x^2 - 2x + 10$

(a) Estimate $f'(1)$ using $h = 0.03$.

Answer: _____

(b) Give the equation of the tangent line at $x = 1$. (Assume that $f'(1) = 10$)

Answer: _____

(c) Estimate $f(1.1)$ using the tangent line

Answer: _____