MATH 112
Exam I - Version 1
January 27, 2005

Name _____

Student ID #_____

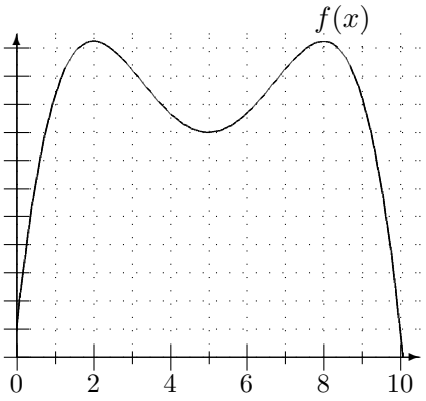
Section _____

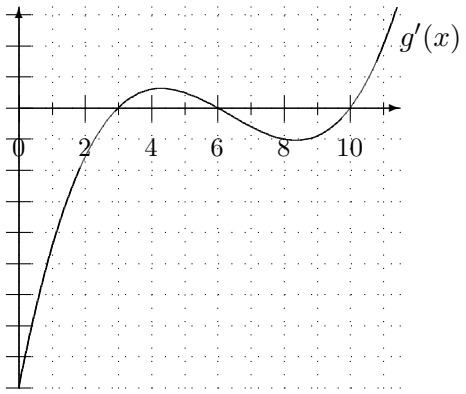
1	11	
2	12	
3	15	
4	12	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains four problems.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method when an algebraic method is available, you may not receive full credit.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (11 points) Below is the graph of a function $f(x)$ and a graph of $g'(x)$, the derivative of a function $g(x)$. The graph of $g(x)$ is not shown.





Answer the following questions about the graphs of $f'(x)$ and $g(x)$.

(a) Name all values of x at which the graph of $f'(x)$ crosses the x-axis.

(b) Name all values of x at which the graph of $g(x)$ has a horizontal tangent line.

(c) Name all intervals on which the graph of $f'(x)$ is above the x-axis.

(d) Name all intervals on which the graph of $g(x)$ is decreasing.

(e) Which of the following is true about the graph of $f'(x)$ on the interval from $x = 4$ to $x = 6$?

i. It decreases and then increases.
ii. It is always decreasing.
iii. It increases and then decreases.
iv. It is always increasing.

ANSWER: _____

2. (12 points) Compute the derivatives. Do not simplify.

   (a) Find $\dfrac{dy}{dx}$ if $y = \sqrt[3]{x} - \dfrac{4}{\sqrt[3]{x^2}}$.

   (b) Find $R'(q)$ if $R(q) = q^5\left(1 + \dfrac{2}{q^3}\right)$.

   (c) Find $\dfrac{ds}{dt}$ if $s = \dfrac{5t^6 - 4t^2 + t}{t}$.

3. (15 points) Let $A(t)$ represent the amount of water (in *thousands* of gallons) that flows into a reservoir in t hours. We are not told the formula for $A(t)$, but instead are told that

$$\frac{A(t+m)-A(t)}{m} = 20 - 2t - m.$$

(a) Compute the average rate of flow into the reservoir during the half-hour interval beginning at $t = 4$.

ANSWER: _____thousand gallons per hour

(b) Find a value of h so that $A(6+h) - A(6) = 16$.

ANSWER: $h =$_____

(c) Compute the instantaneous rate of flow into the reservoir at $t = 8.73$ hours.

ANSWER: _____thousand gallons per hour

(d) Suppose that there are 6000 gallons in the reservoir at $t = 2$ hours and that no water flows **out** of the reservoir for the next three hours. How much water is in the reservoir at $t = 5$ hours?

ANSWER: _____thousand gallons

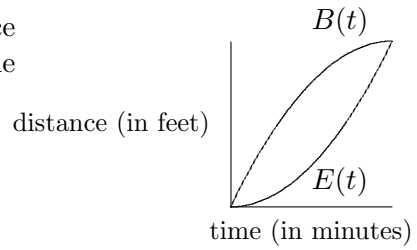
4. (12 points)

Bert and Ernie are playing with remote-control cars. To the right are the distance vs. time graphs for each of their cars. The formulas for the graphs are

$$B(t) = -t^2 + 16t$$

and

$$E(t) = t^2.$$



(a) Find the time at which Ernie's car is traveling 13.44 feet per minute faster than Bert's.

ANSWER: $t =$_____minutes

(b) Write a formula in terms of h for $B(1+h) - B(1)$. Write your formula in the form: $(\quad)h^2 + (\quad)h + (\quad)$.

ANSWER: $B(1+h) - B(1) = (\qquad)h^2 + (\qquad)h + (\qquad)$

(c) How far from the starting location is Ernie's car when Bert's instantaneous speed is 8.86 feet per minute?

ANSWER: _____feet