MAT 5-119 Calculus of a Single Variable I

Exam 1 November 2, 2015

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name

For credit on these problems, you must show your work. Don't approximate your answers unless directed to do so. Graphing calculators are allowed. 75 pts. possible

1. (6 pts.)Tell whether the following function are even, odd, or neither. Justify your answers.

a. 3cos 3x

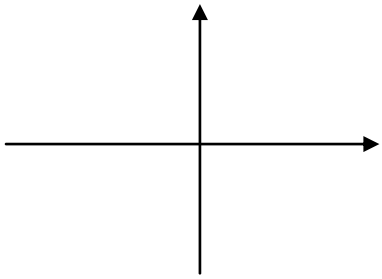
b. f′(x) where f(x) = 4x - 5.

c. $\frac{1}{x} + \tan x$

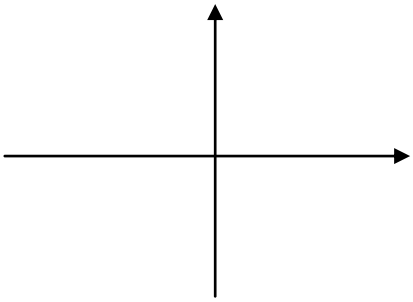
2. (3 pts.) Let f be the function given by the rule: f(x) = $\frac{1}{x+2} - 3$. This function is obtained by shifting a standard rational function. Explain the shifting and use this information to give the range of f.

3. (3 pts.) Let g be the function given by the rule: g(x) = $\sqrt{4-x^2}$ Find the natural domain of g. Explain.

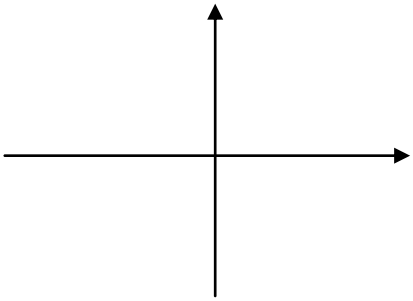
4. (8 pts.) Let the graph of g(x) pictured below:



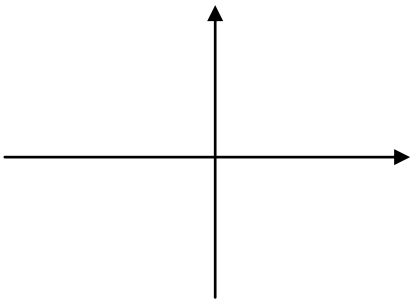
a. Sketch the graph of g(-x)



b. Sketch the graph of -g(x)

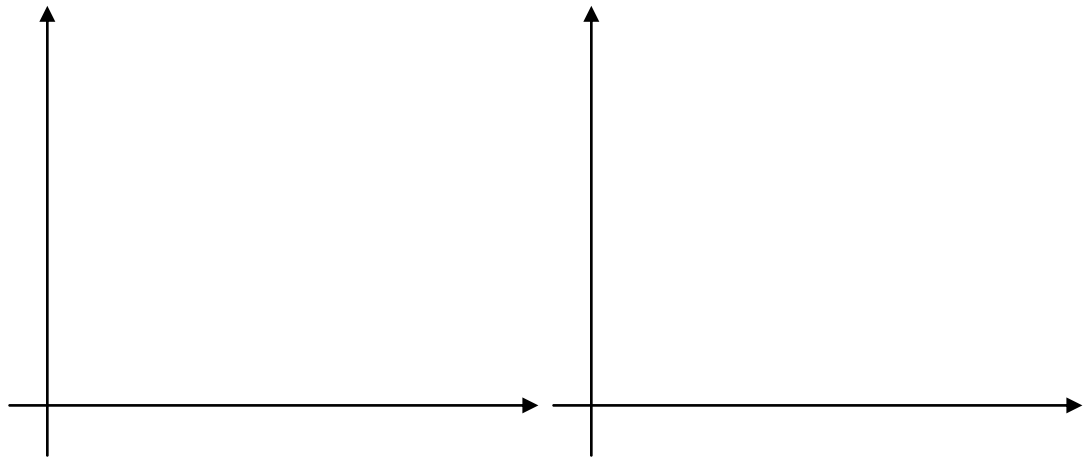


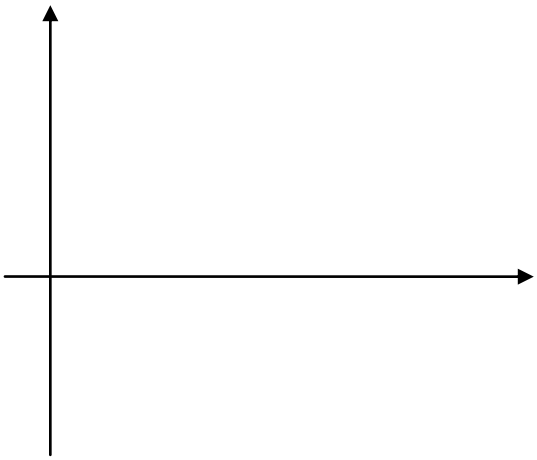
c. Sketch the graph of g′(x)



5. (9 pts.) After a braking test on a straight track on the Utah Salt Flats, the driver reported: "I accelerated smoothly from rest. After 15 seconds, I was cruising at 60 mph. After 90 seconds, I hit the brakes. The car decelerated, but I couldn't stop in time. I hit the crash barrier 10 seconds later at 10 mph.

   a. – c. On separate graphs, sketch plausible graphs of distance traveled, velocity, and acceleration (**add axis labels and units; 1 mile per hour is equal to 1.47 feet per second).**





6. (5 pts.) The table below contains data about the average annual concentration in parts per million of carbon dioxide in the atmosphere. Us this data to estimate the rate at which the concentration of carbon dioxide in the atmosphere was increasing (in ppm/yr) in 1999. Show your work.

Year	1998	1999	2000	2001
Concentration	356.9	358.8	360.9	362.7

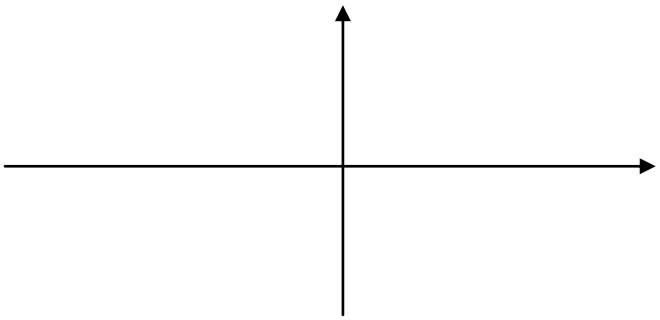
7. (7 pts.) The equations of motion of a ball thrown straight up are given by $h(t) = 74 + 38t - 16t^2$ and $v(t) = 38 - 32t$.
   a. What is the initial height of the ball?

   b. What is the initial velocity of the ball?

   c. At what time does the ball reach its maximum height? What is the height of the ball at that time? Justify your answer with calculus techniques.

8. (4 pts.) Let f be a function such that $f(0) = 3$ and $f'(x) \leq 5$ for all x. What can be said about the value of f(2)? Justify your answer.

9. (14 pts.) The graph of a derivative of a function f is shown below. Use this graph to answer questions about f. Briefly justify ALL of your answers.



a. On which intervals, if any, is f increasing?

b. At which values of x, if any, does f have a stationary point?

c. At which values of x, if any, does f have a local maximum point?

d. Where does f have points of inflection?

e. Is f concave up at x=1?

f. Suppose that f(-2) = 3. Find an equation of the line tangent to f at x = -2.

10. (11 pts.) The derivative of a function f is given by the rule $f'(x) = 3 - x^2$. Use this definition to answer questions about f. Briefly justify ALL of your answers.

a. On which intervals, if any, is f decreasing?

b. At which values of x, if any, does f have a stationary point?

c. At which values of x, if any, does f have a local minimum point?

d. At which values of x, if any, does f have a terrace point?

11. (5 pts.) Give the piecewise function rule for the function defined by the following graph: