Math 258 – Second Hour Exam – Spring, 2004 v1

Name _____

Show your work. Partial credit will be given where appropriate. 16 points per problem

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For problems 1 - 3: Consider the function $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 6x + 4$

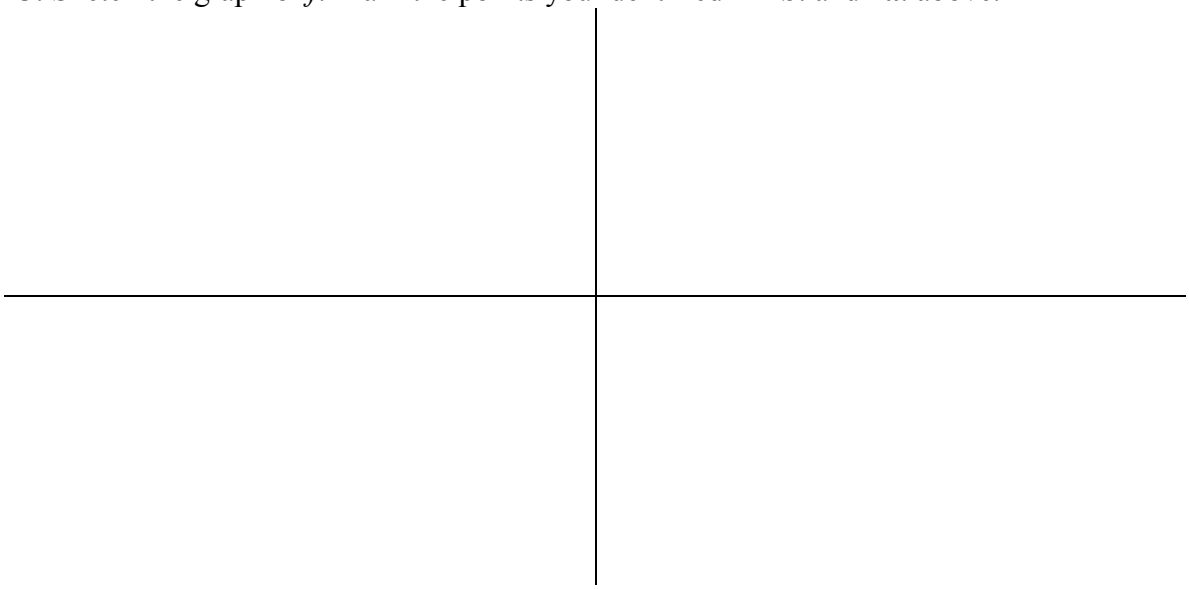
1. a. Find all intervals where *f* is increasing.

b. Find all inflection points of *f*.

2. a. Find all relative maxima and minima of *f*.

b. Find all intervals where *f* is concave up.

3. Sketch the graph of *f*. Mark the points you identified in **1b**. and **2a**. above.



4. The managers of the the new Tacoma Narrows Bridge are deciding what toll to charge. Results from other bridges in similar cities show that when the toll is $1.50, the bridge traffic is about 12,500 cars per day. A charge of $2.50 reduces the traffic to about 7,500 cars per day. Assume that the relationship between the toll and traffic load is linear. Maintenance costs are influenced by the traffic load. The costs are modelled by:

$C(x) = .60x + 1000$ where *C(x)* is in dollars per day, and *x* is the traffic load.

a. Express the toll as a function of the traffic load.

b. Express the revenue function, R(x) as a function of the traffic load.

5. a. What toll will maximize the revenues for the bridge?

b. What toll will maximize the profits for the bridge?

6. Find the derivative of:

a. $f(x) = \left(\frac{x}{x+15} \right)^4$

b. $f(x) = 12\left(\frac{x^2 + x}{x+1} \right)$

c. $f(x) = \sqrt{(x^3 + 3x)^3}$

Extra credit: (4 points) In class, we decided that the chain rule $\left(\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx} \right)$ was so much fun that we would call it the Fun Rule. But the product rule $\left(\frac{d(f * g)}{dx} = \frac{df}{dx} g + f \frac{dg}{dx} \right)$ is also an important rule. It should be called:

a. The Cool Rule _____

b. The Awesome Rule _____

c. The Super Rule _____

d. _____(fill in your own!)