

VCU
MATH 200
CALCULUS I

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TEST 3



June 9, 2014

Name: _____

Score: _____

Directions. Answer the questions in the space provided. Unless noted otherwise, you must show and explain your work to receive full credit. Put your final answer in a when appropriate.

This is a closed-book, closed-notes test. Calculators, computers, etc., are not used.

1. (30 points) Find the indefinite integrals.

$$(a) \int (4x^5 + x + 2) dx =$$

$$(b) \int \sqrt{x} dx =$$

$$(c) \int \frac{1}{\sqrt{1-x^2}} dx =$$

$$(d) \int \sec(x) \tan(x) dx =$$

$$(e) \int \frac{1}{x} dx =$$

2. (10 pts.)

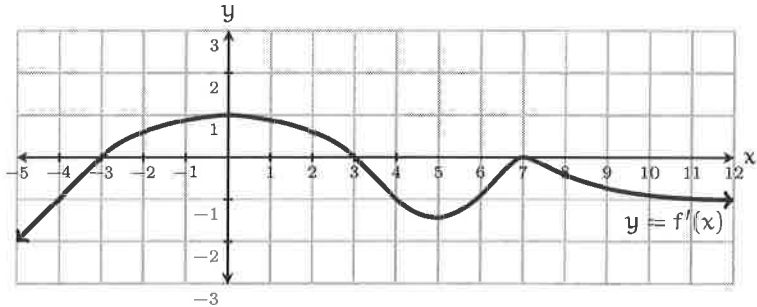
(a) Is the following equation true or false? Explain.

$$\int x \cos(x) \, dx = x \sin(x) + \cos(x) + C$$

(b) If $f(x)$ and $g(x)$ are differentiable functions, then

$$\int (f'(x)g(x) + f(x)g'(x)) \, dx =$$

3. (10 pts.) The graph $y = f'(x)$ of the derivative of a function $f(x)$ is shown. Answer the questions about $f(x)$.



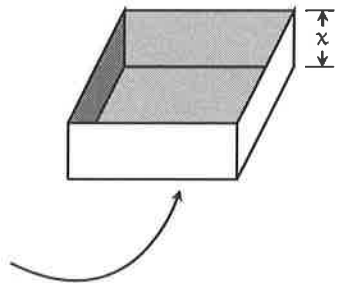
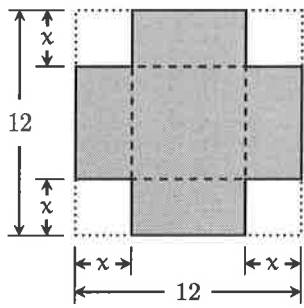
- State the intervals on which $f(x)$ increases.
- State the intervals on which $f(x)$ decreases.
- List all critical points of $f(x)$.
- At which of its critical points does $f(x)$ have a local maximum?
- At which of its critical points does $f(x)$ have a local minimum?
- State the intervals on which the function $f(x)$ is concave up.
- State the intervals on which the function $f(x)$ is concave down.
- Based on this information, sketch a possible graph of $f(x)$ on the coordinate axis above.

4. (20 pts.) Find the limits.

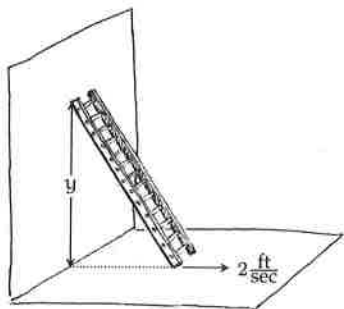
(a) $\lim_{x \rightarrow 0} \frac{x^2}{\ln(\sec(x))} =$

(b) $\lim_{x \rightarrow 0^+} x \ln(x) =$

5 (10 pts.) An open-top box is made from a 12 by 12 inch piece of cardboard by cutting a square from each corner, and folding up. What should x be to maximize the volume of the box?



6. (10 pts.) A 10-foot ladder is leaning against a wall, as illustrated. Its base slides away from the wall at a rate of 2 feet per second. At what rate is the height y changing when the base is 6 feet from the wall?



7. (10 pts.) Suppose $f(x)$ is a function for which $f'(x) = 2x + \cos(x)$ and $f(\pi) = 0$. Find $f(x)$.