

VCU  
MATH 200  
CALCULUS I

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TEST 2



October 23, 2015

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. Please put all phones away.

1. (20 points) Warmup: short answer.

(a) If  $f(x) = e^5 + \ln(x) + x^3$ , then  $f'(x) =$

(b) If  $f(x) = \ln(x)$ , then  $f'(3) =$

(c)  $\lim_{h \rightarrow 0} \frac{e^{\ln(3)+h} - e^{\ln(3)}}{h} =$

(d)  $\frac{d}{dx} [\sin^{-1}(x)] =$

(e)  $\frac{d}{dx} [5^x] =$

(f)  $\frac{d}{dx} [\tan(x)] =$

(g)  $\frac{d}{dx} [\sqrt[3]{x^5}] =$

(h)  $\frac{d}{dx} [\sec(\pi x)] =$

(i)  $\frac{d}{dx} \left[ \frac{1}{x} \right] =$

(j)  $\frac{d}{dx} [5x^3 e^x] =$

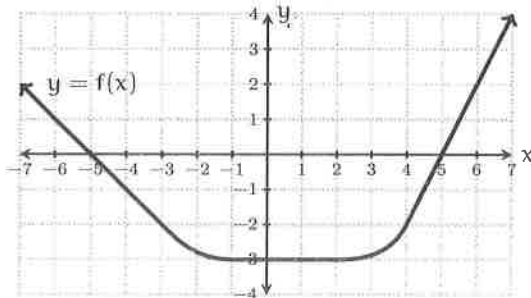
2. (5 points) Find the equation of the tangent line to the graph of  $y = \frac{1}{x}$  at the point where  $x = 2$ .

3. (5 points) Information about functions  $f(x)$ ,  $g(x)$  and their derivatives is given in the table below.

$x$	0	1	2	3	4	5
$f(x)$	-4	-2	0	1	1	0
$f'(x)$	2	1	1	3	0.5	-1
$g(x)$	10	9	7	4	0	-4
$g'(x)$	0	-0.5	-1	-3	-4	-4

Suppose  $h(x) = f(x)g(x)$ . Find  $h'(3)$ . Show your work.

4. (5 points) A function  $f(x)$  is graphed below. Using the same coordinate axis, sketch the graph of the derivative  $f'(x)$ .



5. (20 points) Find the following derivatives.

(a)  $\frac{d}{dx} [ \tan^{-1}(\ln(x)) + \pi ] =$

(b)  $\frac{d}{dx} [ x^2 (\cos(x))^5 ] =$

(c)  $\frac{d}{dx} \left[ \frac{x^2 - 4x}{e^{3x}} \right] =$

(d)  $\frac{d}{dx} [ \ln(\sin^3(x)) ] =$

6 (10 points) Use logarithmic differentiation to differentiate  $y = (\sin(x))^x$ .

7 (10 points) Recall: the derivative of  $f(x)$  is  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ .

Use this to find derivative of the function  $f(x) = \sqrt{x}$ .

8. (15 points) An object moves on a straight line in such a way that its distance from its starting point at time  $t$  seconds is  $s(t) = 3\sqrt[3]{t^4} + 4t$  feet. How far away from the starting point is it when its velocity is 12 feet per second?

9. (10 points) This question concerns the equation  $\cos(y) + x^2 + x = e^y$ .

(a) Use implicit differentiation to find  $\frac{dy}{dx}$ .

(b) Use your answer from part (a) to find the slope of the tangent line to the graph of  $\cos(y) + x^2 + x = e^y$  at the point  $(0, 0)$ .