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 box 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 $f(x) = x^3 + \ln(x) + \pi^3$, then $f'(x) =$

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

(c) $\lim_{h \to 0} \dfrac{\sin\left(\frac{\pi}{3} + h\right) - \sin\left(\frac{\pi}{3}\right)}{h} =$

(d) $\dfrac{d}{dx}\left[\, \sec^{-1}(x) \,\right] =$

(e) $\dfrac{d}{dx}\left[\, 3^x \,\right] =$

(f) $\dfrac{d}{dx}\left[\, \tan^{-1}(x) \,\right] =$

(g) $\dfrac{d}{dx}\left[\, \sqrt[3]{x^5} \,\right] =$

(h) $\dfrac{d}{dx}\left[\, \cos(\pi x) \,\right] =$

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

(j) $\dfrac{d}{dx}\left[\, 5x^2 \ln(x) \,\right] =$

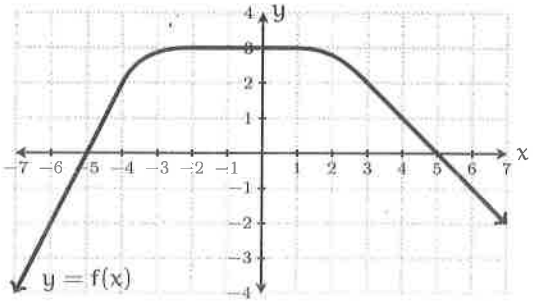
2. (5 points) Find the equation of the tangent line to the graph of $y = \sqrt{x}$ at the point where $x = 9$.

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 $h(x) = f(g(x))$. 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) $\frac{d}{dx}\left[\ \tan(\ln(x)) + x\ \right] =$

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

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

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

6 (10 points) Use logarithmic differentiation to differentiate $y = (x^3+x)^x$.

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

Use this to find derivative of the function $f(x) = \frac{1}{x}$.

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 $\cos(y^2) + x = e^y$.

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

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