VCU

MATH 200

Calculus I

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Test 2

✍

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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.

1. (20 points) Warmup: short answer.

(a) $8^{4/3} =$

(b) $\sin^{-1}(1/2) =$

(c) $\ln\left(\sqrt[5]{e^7}\right) =$

(d) $e^{\ln(2)+\ln(3)} =$

(e) $\log_{10}\left(\frac{1}{10}\right) =$

(f) $\frac{d}{dx}\left[\, \sin^{10}(x) \,\right] =$

(g) $\frac{d}{dx}\left[\, \sin\left(x^{10}\right) \,\right] =$

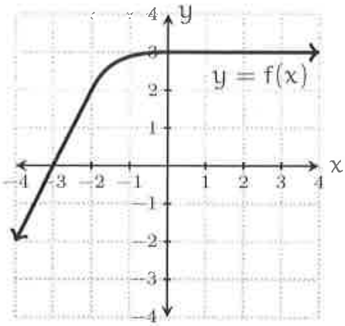
(h) $\frac{d}{dx}\left[\, \sin(x)\, x^{10} \,\right] =$

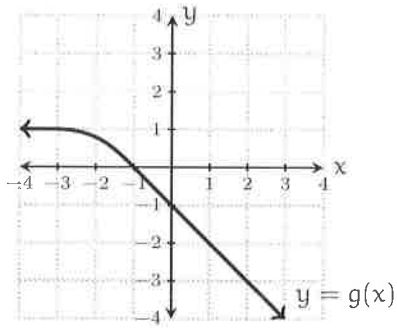
(i) $\frac{d}{dx}\left[\, \ln(x) \,\right] =$

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

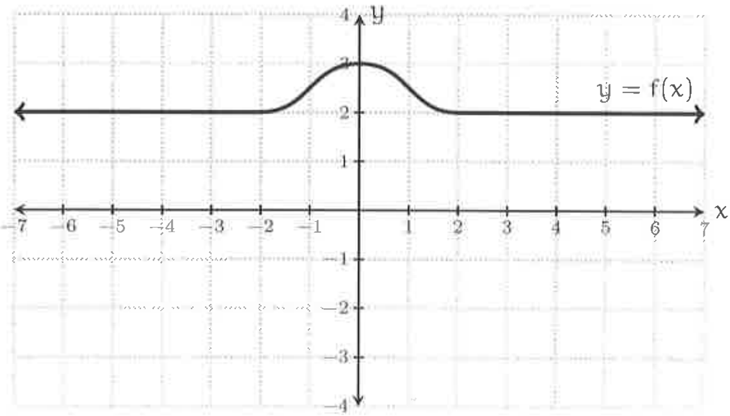
2. (5 points) Simplify: $\cos(\sin^{-1}(x)) =$

3. (5 points) Two functions $f(x)$ and $g(x)$ are graphed below. Let $h(x) = f(g(x))$. Estimate $h'(2)$. 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) $\dfrac{d}{dx}\left[\dfrac{x^2+5}{x+\sec(x)}\right]=$

(b) $\dfrac{d}{dx}[\tan^{-1}(5x)]=$

(c) $\dfrac{d}{dx}[\cos(\tan(x^3))]=$

(d) $\dfrac{d}{dx}[\ln(xe^x)]=$

6 (10 points) Find the inverse of the function $f(x) = e^{x^3+1}$.

7 (10 points) Suppose an object moves on a straight line in such a way that its distance from a fixed point at time t is $s(t) = t^3 - 9t^2 + 15t + 4$. Find the times t at which its velocity is 0.

8. (5 points) State the limit definition of the derivative $f'(x)$ of a function $f(x)$.

9. (10 points) Suppose $f(x) = \sqrt{x}$.

Find the **equation** of the line tangent to the graph of $f(x)$ at the point $(9, 3)$.

10. (10 points) This question concerns the equation $x\sin(y) = y$.

(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 $x\sin(y) = y$ at the point $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$.