

MATH 200
CALCULUS I

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TEST 2



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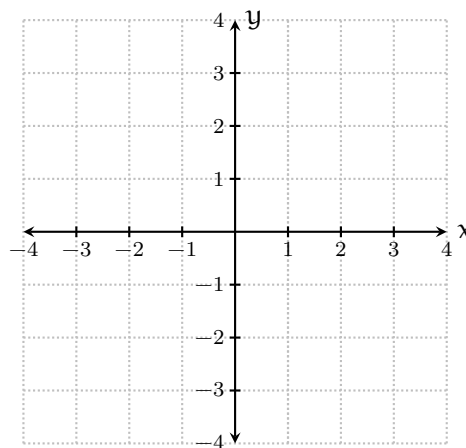
Name: _____

Score: _____

Directions. Solve the following questions in the space provided. Unless noted otherwise, you must show your work to receive full credit. This is a closed-book, closed-notes test. Calculators, computers, etc., are not used. Put a your final answer in a box, where appropriate.

7. (5 points) Simplify: $\sec(\sin^{-1}(x)) =$

8. (10 points) Sketch the graph of both $y = e^x$ and $y = \ln(x)$ below. Be sure to indicate which graph is which.



1. (20 points) Warmup: short answer.

(a) $\frac{d}{dx} [\cos(x) + \ln(x)] =$

(f) $\ln(\sqrt{e}) =$

(b) $\frac{d}{dx} [\cos(x) \ln(x)] =$

(g) $\cos^{-1}(1/2) =$

(c) $\frac{d}{dx} [\cos(\ln(x))] =$

(h) $\ln(\sin(\pi/2)) =$

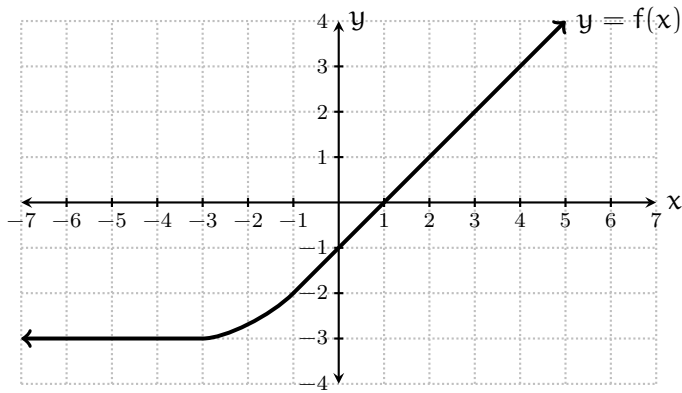
(d) $\frac{d}{dx} [x^e] =$

(i) $\lim_{x \rightarrow 1} \tan^{-1}(x) =$

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

(j) $\lim_{x \rightarrow -\infty} e^x =$

2. (10 points) Answer the following questions concerning the function $f(x)$ graphed below.



- (a) Using the coordinate axis above, sketch the graph of the derivative $y = f'(x)$.
- (b) Suppose $g(x) = x^2f(x)$. Find $g'(3)$.

3. (15 points) An object moving on a straight line is $s(t) = t^3 - 3t^2$ feet from its starting point at time t seconds.

- (a) What is the object's velocity at time t ?
- (b) What is its acceleration at time t ?
- (c) Find its acceleration when its velocity is -3 feet per second.

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4. (10 points) This problem concerns the functions $f(x) = x^2 + 2x^3$ and $g(x) = x^2 - 2x^3 + 48x$. Find all x for which the tangent to $y = f(x)$ at $(x, f(x))$ is parallel to the tangent to $y = g(x)$ at $(x, g(x))$.

5. (20 points) Find the following derivatives.

(a) $\frac{d}{dx} \left[\tan(x) + \frac{1}{x^2} + e^2 + 3 \right] =$

(b) $\frac{d}{dx} \left[\sqrt{\frac{x^2 + 5}{x + 1}} \right] =$

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

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

6. (10 points) This question concerns the equation $xy^3 = xy + 6$.

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

(b) Use your answer from part (a) to find the **equation of the tangent line** to the graph of $xy^3 = xy + 6$ at the point $(1, 2)$.