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) \( \frac{d}{dx} \left[ \cos(x) + \ln(x) \right] = \)

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

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

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

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

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

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

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

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

(j) \( \lim_{x \to -\infty} e^x = \)
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 $g(x) = x^2 f(x)$. 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.

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 $(x, g(x))$. 

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

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 \((1, 2)\).