Name: _____

Directions: Each question is 5 points. Closed book, no calculators. Put phones away. Put your answer in a $\boxed{\text{box}}$.

1. Answer the questions about the functions graphed below.
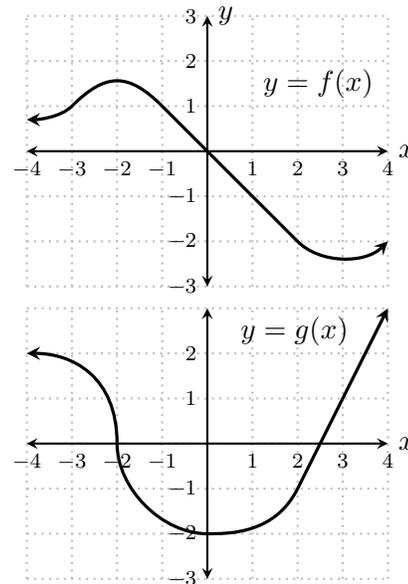
   (a) $f'(-2) =$

   (b) $f'(0) =$

   (c) $\lim\limits_{x \to -2} g'(x) =$

   (d) If $h(x) = f(x)g(x)$, then $h'(0) =$

   (e) If $h(x) = f\big(g(x)\big)$, then $h'(3) =$

2. (8 points) Find the derivatives of the following functions.

   (a) $f(x) = x^4 - 3x + \pi^2$

   (b) $f(x) = \sin^{-1}(x)$

   (c) $f(x) = e^{-x}$

   (d) $f(x) = \tan(\pi x)$

3. Find the equation of the tangent line to the graph of $y = \tan^{-1}(x)$ at the point where $x = 1$.   Show work.

4. $\dfrac{d}{dx}\left[\sqrt{x^4 + x^2 + 1}\,\right] =$

5. $\dfrac{d}{dx}\left[x^2 \cos\left(x^2\right)\right] =$

6. $\dfrac{d}{dx}\left[\dfrac{e^x}{x}\right] =$

7. $\dfrac{d}{dx}\left[\left(x^3 + e^{\sec(x)}\right)^7\right] =$

8. Suppose $y = x\ln(x) - x + 3$.

   (a) $\dfrac{dy}{dx} =$

   (b) $\dfrac{d^2y}{dx^2} =.$

9. Given the equation $x^4 + 2xy + y^4 = \sin(x)$, find y'.   Show work.

10. A function $f(x)$ is graphed below. Sketch the graph of its derivative $f'(x)$.