1. The slope of a curve at a point (x, y) is defined as $\lim_{h\to 0}\dfrac{(x+h)^3+(x+h)^2-x^3-x^2}{h}$.

Which of the following is the equation of the line tangent to this curve at $(1, 2)$?

(a) $y=5x-2$ (b) $y=3x-9$ (c) $y=5x-3$ (d) $y=3x-6$ (e) $y=x-2$

2. If $f(x)=g(h(x))$ and if $h(2)=5$, $h'(2)=-5$, and $g'(5)=3$, which of the following is the value of $f'(2)$?

(a) 3 (b) –15 (c) 15 (d) –3 (e) 18

3. Which of the following is $\dfrac{dy}{dx}$, the first derivative of $y=f(x)$ if $x^2y+\sec(y)=8$?

(a) $-2xy\left(x^2\sec(y)\tan(y)\right)$ (b) $\dfrac{x^2y}{\sec(y)\tan(y)}$ (c) $\dfrac{\sec(y)\tan(y)}{-2}$

(d) $\dfrac{-2xy}{x^2-\sec(y)\tan(y)}$ (e) $\dfrac{-2xy}{x^2+\sec(y)\tan(y)}$

4. Which of the following is the derivative of $\sin^4\left(\cot^3(7x)\right)$?

(a) $84\sin^3\left(\cot^3(7x)\right)\cot^2(7x)$

(b) $-84\sin^3\left(\cot^3(7x)\right)\cos\left(\cot^3(7x)\right)\csc^2(7x)$

(c) $-84\sin^3\left(\cot^3(7x)\right)\cos\left(\cot^3(7x)\right)\cot^2(7x)\csc^2(7x)$

(d) $12\sin^3\left(\cot^3(7x)\right)\cos\left(\cot^3(7x)\right)\cot^2(7x)\csc^2(7x)$

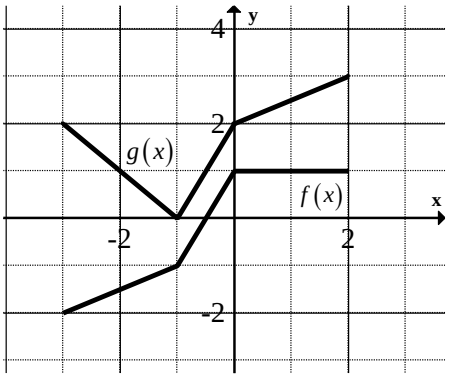
(e) $-12\sin^3\left(\cot^3(7x)\right)\cos\left(\cot^3(7x)\right)\cot^2(7x)\csc^2(7x)$

5. $\lim_{h\to 0}\dfrac{\cot\left(3(x+h)\right)-\cot(3x)}{h}=$

(a) $-\csc^2(3x)$ (b) $-3\csc(3x)\cot(3x)$ (c) $\csc(3x)\cot(3x)$

(d) $-3\csc^2(3x)$ (e) $3\sec^2(3x)$

6. Let $f(x)$ and $g(x)$ be the piecewise linear functions whose graphs are shown below. If $h(x)=\dfrac{f(x)}{g(x)}$, then what is the value of $h'(-2)$?



(a) $-\dfrac{3}{2}$ (b) –1 (c) $-\dfrac{1}{2}$ (d) 1 (e) $\dfrac{3}{2}$

7. What is the derivative of $y = \dfrac{4x^2 - 3x + 7}{5x}$?

(a) $\dfrac{4x^2 + 7}{25x^2}$ (b) $\dfrac{4x^2 - 7}{5x^2}$ (c) $\dfrac{7 - 4x^2}{5x^2}$ (d) $\dfrac{8x - 3}{5}$ (e) $\dfrac{4x - 8}{25x}$

8. If $f(x) = \sqrt{6\sin(x) + 9}$, then the derivative of f at $x = 0$ is

(a) $\dfrac{1}{2\sqrt{3}}$ (b) 0 (c) 1 (d) $\dfrac{\sqrt{3}}{6}$ (e) $\sqrt{3}$

9. If $f'(a)$ does NOT exist, which of the following MUST be true?

(a) $f(x)$ is discontinuous at $x = a$

(b) $\lim\limits_{x \to a} f(x)$ does not exist

(c) f has a vertical tangent at $x = a$

(d) f has a "hole"/removable discontinuity at $x = a$

(e) None of the above are necessarily true

10. Given that j, k, and m are constants, and $f(x) = m - 2kx$, what is $f'(j) =$?

(a) m (b) $m - 2jk$ (c) $-2jk$ (d) $-2k$ (e) j

11. If $y = 2\sqrt{x} - \dfrac{1}{2\sqrt{x}}$, then the derivative of y with respect to x is given by

(a) $x + \dfrac{1}{x\sqrt{x}}$ (b) $\dfrac{1}{\sqrt{x}} + \dfrac{1}{x\sqrt{x}}$ (c) $\dfrac{4x - 1}{4x\sqrt{x}}$ (d) $\dfrac{1}{\sqrt{x}} + \dfrac{1}{4x\sqrt{x}}$ (e) $\dfrac{4}{\sqrt{x}} + \dfrac{1}{x\sqrt{x}}$

12. If $y = \dfrac{x - 3}{2 - 5x}$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{17 - 10x}{(2 - 5x)^2}$ (b) $\dfrac{13}{(2 - 5x)^2}$ (c) $\dfrac{x - 3}{(2 - 5x)^2}$ (d) $\dfrac{17}{(2 - 5x)^2}$ (e) $\dfrac{-13}{(2 - 5x)^2}$

13. $\dfrac{d}{dx}\left[\left|g(x)\right|\right] = \dfrac{g(x)}{\left|g(x)\right|} \cdot g'(x)$. The function $f(x) = \left|x^2 - 4\right|$ is NOT differentiable at

(a) $x = 2$ only (b) $x = -2$ only (c) $x = -2$ or $x = 2$ only

(d) $x = 0$ only (e) $x = 2$ or $x = -2$ or $x = 0$