

Derivatives Quiz Review

1. $f(x) = 3x^2 \cos(2x)$

$$f'(x) = (6x) \cos(2x) + (3x^2)(-\sin(2x))(2)$$

$$f'(x) = 6x \cos(2x) - 6x^2 \sin(2x)$$

2. $f(x) = e^{3x} + \tan^3(4x^2)$

$$f(x) = e^{3x} (\tan(4x^2))^3$$

$$f'(x) = e^{3x} (3)(\tan(4x^2))^2 + e^{3x} 3(\tan(4x^2))^2 (\sec^2(4x^2))(8x)$$

$$f'(x) = 3e^{3x} \tan^2(4x^2) + 24x e^{3x} \tan^2(4x^2) \sec^2(4x^2)$$

3. $f(x) = \frac{\cot^2(3x)}{e^{3x}} = \frac{(\cot(3x))^2}{e^{3x}}$

$$f'(x) = \frac{2(\cot(3x))(-\csc^2(3x))(3)e^{3x} - (\cot(3x))^2 e^{3x}(3)}{(e^{3x})^2}$$

$$f'(x) = \frac{-6e^{3x} \cot(3x) \csc^2(3x) - 3e^{3x} \cot^2(3x)}{e^{6x}}$$

4. $f(x) = \sin(3x^3)$

$$f'(x) = \cos(3x^3)(9x^2)$$

$$f'(x) = 9x^2 \cos(3x^3)$$

5. $f(x) = \sqrt[3]{\csc^2(2x^5)}$

$$f(x) = (\csc(2x^5))^{2/3}$$

$$f'(x) = \frac{2}{3} (\csc(2x^5))^{-1/3} (-\csc(2x^5) \cot(2x^5))(10x^4)$$

$$f'(x) = -\frac{20}{3} x^4 \csc^{2/3}(2x^5) \cot(2x^5)$$

6. $f(x) = \sec^2(\sqrt{x}) \cos(\sqrt{x})$

$$f(x) = (\sec(x^{1/2}))^2 \cos(x^{1/2})$$

$$f(x) = \sec^2(x^{1/2}) \cos(x^{1/2})$$

$$f'(x) = \sec(x^{1/2}) \tan(x^{1/2}) \left(\frac{1}{2} x^{-1/2} \right) = \frac{\sec(x^{1/2}) \tan(x^{1/2})}{2x^{1/2}}$$

$$7. f(x) = \frac{1 - \cos^2(e^{2x})}{\cos(e^{2x})} = \frac{\sin^2(e^{2x})}{\cos(e^{2x})} = \tan(e^{2x}) \sin(e^{2x})$$

$$f'(x) = \sec^2(e^{2x})(e^{2x})(2) \sin(e^{2x}) + \tan(e^{2x}) \cos(e^{2x})(e^{2x})(2)$$

$$f'(x) = 2e^{2x} \sec^2(e^{2x}) \sin(e^{2x}) + 2e^{2x} \tan(e^{2x}) \cos(e^{2x})$$

$$8. f(x) = 1 + \frac{\cancel{\csc(3x^2)} \tan^2(3x^2) \cancel{\sin(3x^2)}}{\tan^2(3x^2) + 1} - \cos^2(3x^2)$$

$$f(x) = 1 + \frac{\tan^2(3x^2)}{\sec^2(3x^2)} - \cos^2(3x^2)$$

$$f(x) = \sin^2(3x^2) + \frac{\tan^2(3x^2)}{\sec^2(3x^2)}$$

$$f(x) = \sin^2(3x^2) + \sin^2(3x^2)$$

$$f(x) = 2\sin^2(3x^2)$$

$$f(x) = 2(\sin(3x^2))^2$$

$$f'(x) = 4(\sin(3x^2)) \cos(3x^2)(6x)$$

$$f'(x) = 24x \sin(3x^2) \cos(3x^2)$$

$$9. f(x) = 3e^5 \sqrt[3]{x^2}$$

$$f(x) = 3e^5 x^{2/3}$$

$$f'(x) = 2e^5 x^{-1/3} = \frac{2e^5}{x^{1/3}}$$

$$10. f(x) = 3x^2 e^{\sqrt{2x^4-5}}$$

$$f(x) = 3x^2 e^{(2x^4-5)^{1/2}}$$

$$f'(x) = (6x) e^{(2x^4-5)^{1/2}} + (3x^2) e^{(2x^4-5)^{1/2}} \cdot \frac{1}{2} (2x^4-5)^{-1/2} (8x^3)$$

$$f'(x) = 6x e^{(2x^4-5)^{1/2}} + 12x^5 e^{(2x^4-5)^{1/2}} (2x^4-5)^{-1/2}$$

$$11. f(x) = 4\sqrt{x} e^{\csc(5x)}$$

$$f(x) = 4x^{1/2} e^{\csc(5x)}$$

$$f'(x) = 2x^{-1/2} e^{\csc(5x)} + (4x^{1/2}) e^{\csc(5x)} (-\csc(5x) \cot(5x)) (5)$$

$$f'(x) = 2x^{-1/2} e^{\csc(5x)} - 20x^{1/2} e^{\csc(5x)} \csc(5x) \cot(5x)$$

$$12. f(x) = \frac{4e^{\pi}}{\csc^3(2x)}$$

$$f(x) = 4e^{\pi} (\sin(2x))^3$$

$$f'(x) = 12e^{\pi} (\sin(2x))^2 (\cos(2x)) (2)$$

$$f'(x) = 24e^{\pi} \sin^2(2x) \cos(2x)$$

$$13. f(x) = \frac{x^3 - c^2}{x^2 + c^3}$$

$$f'(x) = \frac{(3x^2)(x^2 + c^3) - (x^3 - c^2)(2x)}{(x^2 + c^3)^2}$$

$$14. f(x) = (x+4)^4 (2x^2-3)^3$$

$$f'(x) = 4(x+4)^3 (1) (2x^2-3)^3 + (x+4)^4 3(2x^2-3)^2 (4x)$$

$$f'(x) = 4(x+4)^3 (2x^2-3)^3 + 12x(x+4)^4 (2x^2-3)^2$$

$$15. f(x) = b^{\sqrt{x}} \cos(4x^3)$$

$$f(x) = b^{x^{1/2}} \cos(4x^3)$$

$$f'(x) = b^{x^{1/2}} \cdot \ln b \cdot \left(\frac{1}{2} x^{-1/2}\right) \cos(4x^3) + b^{x^{1/2}} (-\sin(4x^3)) (12x^2)$$

$$f'(x) = b^{x^{1/2}} \ln b \cdot \frac{1}{2} x^{-1/2} \cos(4x^3) - 12x^2 \cdot b^{x^{1/2}} \cdot \sin(4x^3)$$

$$16. f(x) = \sec(2^{5x})$$

$$f'(x) = \sec(2^{5x}) \tan(2^{5x}) (2^{5x}) (\ln 2) (5)$$