

DERIVATIVES - TRIG FUNCTIONS WORKSHEET ANSWER KEY

1. $f(x) = 4(\cos x)$

$$f'(x) = -4\sin x$$

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

$$f'(x) = 3x \cos(x) + 3\sin(x)$$

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

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

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

4. $f(x) = x - x^2(\cos x)$

$$f'(x) = -2x \cos x + x^2 \sin x + 1$$

5. $f(x) = \frac{\sin x}{x}$

$$f'(x) = \frac{\cos x}{x} - \frac{\sin x}{x^2}$$

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

$$f'(x) = \frac{2x}{\cos x} + \frac{x^2 \sin x}{\cos^2 x}$$

7. $f(x) = 2x(\cos x) + x^2(\sin x)$

$$f'(x) = (x^2 + 2)\cos x$$

8. $f(x) = \sin x \cot x$

$$f'(x) = -\sin x$$

9. $f(x) = 3x^2(\sin x) - x^3(\cos x)$

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

10. $f(x) = (\sin x - \cos x)^2$

$$f'(x) = 2 - 4\cos^2 x$$

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

11. $f(x) = \frac{1 - \cos x}{1 + \cos x}$

$$f'(x) = \frac{2 \sin x}{(\cos x + 1)^2}$$

12. $f(x) = \frac{\cos x}{1 - \sin x}$

$$f'(x) = \frac{1}{1 - \sin x}$$

13. $f(x) = \frac{x + \sin x}{1 - \cos x}$

$$f'(x) = -\frac{x \sin x}{(\cos x - 1)^2}$$

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

$$f'(x) = 0$$

15. $f(x) = \sin(5x + 2)$

$$f'(x) = 5\cos(5x + 2)$$

16. $f(x) = \cos(4 - 3t)$

$$f'(x) = -3\sin(3t - 4)$$

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

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

18. $f(x) = \sin(2x^5)$

$$f'(x) = 10x^4 \cos(2x^5)$$

19. $f(x) = \cos^4(3x)$

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

$$f'(x) = -12\cos^3(3x)[\sin(3x)]$$

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

$$f'(x) = 12x^3(\sin x^4)^2 \cos x^4$$

$$21. f(x) = \sin^2 x + \sin x^2$$

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

$$22. f(x) = (x^4 + \cos^4 x)^4$$

$$f'(x) = 4(x^4 + \cos^4 x)^3 (4x^3 - 4 \cos^3 x \sin x)$$

$$23. f(x) = \frac{\sin(3x)}{\sin(3x) + \cos(3x)}$$

$$f'(x) = \frac{3}{[\cos(3x) + \sin(3x)]^2}$$

$$24. f(x) = \frac{\sin(3x+4)}{(3x+4)}$$

$$f'(x) = \frac{3[(3x+4)\cos(3x+4) - \sin(3x+4)]}{(3x+4)^2}$$

$$25. f(x) = (\sin 3x)(\cos 4x)$$

$$f'(x) = 3\cos(3x)\cos(4x) - 4\sin(3x)\cos(4x)$$

$$26. f(x) = \sin(\cos 5x)$$

$$f'(x) = -5\sin(5x)\cos(\cos(5x))$$

$$27. f(x) = (\cos^{1/3} x - \sin^{1/3} x)^3$$

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

$$f'(x) = -\tan x$$

$$28. f(x) = \ln(\cos x)$$

$$29. f(x) = \cos(\ln x)$$

$$f'(x) = -\frac{\sin(\ln(x))}{x}$$

$$30. f(x) = \ln(x^3 \sin x)$$

$$f'(x) = \frac{1}{x^3 \sin x} (3x^2 \sin x + x^3 \cos x)$$

$$f'(x) = \cot x + \frac{3}{x}$$

$$31. f(x) = (\ln \sin x)^3$$

$$f'(x) = 3(\ln(\sin x))^2 \cdot \frac{1}{\sin x} \cdot \cos x$$

$$f'(x) = 3 \cot x \ln^2(\sin x)$$

$$32. f(x) = x \sin x$$

$$f'(x) = \sin x + x(\cos x)$$

$$f'(x) = \sin x + x \cos x$$

$$33. f(x) = \sin x \cos x$$

$$f'(x) = \cos x(\cos x) + \sin x(-\sin x)$$

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

$$34. f(x) = \tan(8x + 3)$$

$$f'(x) = \frac{8}{\cos^2(8x + 3)}$$

$$35. f(x) = \csc(x^2 + 4)$$

$$f'(x) = -\frac{2x \cos(x^2 + 4)}{\sin^2(x^2 + 4)}$$

$$36. f(x) = \tan^2 x \sec^3 x$$

$$f'(x) = \frac{2 \sin x}{\cos^4 x} + \frac{5 \sin^3 x}{\cos^6 x}$$

$$37. f(x) = e^{-3x} \tan x^{1/2}$$

$$f'(x) = e^{-3x} \cdot 3 \cdot \sin x^{1/2} [\cos x^{1/2}]^{-1} + e^{-3x} \cdot \cos x^{1/2} \cdot \frac{1}{2} x^{-1/2} \cdot [\cos x^{1/2}]^{-1} + e^{-3x} \sin x^{1/2} \cdot -1 [\cos x^{1/2}]^{-2} \cdot -\sin x^{1/2} \cdot \frac{1}{2} x^{-1/2}$$

$$38. f(x) = (\sec 2x) / (\tan 2x + 1)$$

$$f'(x) = \frac{2(\sin(2x) - \cos(2x))}{(\cos(2x) + \sin(2x))^2}$$

$$39. f(x) = \tan^3 6x$$

$$f'(x) = \frac{18 \sin(6x)^2}{\cos(6x)^4}$$

$$40. f'(x) = \ln \ln \sec(2x) \quad f'(x) = -\frac{2 \tan(2x)}{\ln(\cos(2x))}$$