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7. $f(x) = \sin 6x$

$$f'(x) = \cos 6x (6)$$

$$f'(x) = 6 \cos 6x$$

8. $f(x) = \cos 9x$

$$f'(x) = -\sin 9x (9)$$

$$f'(x) = -9 \sin 9x$$

9. $f(\theta) = \cos \frac{2}{3} \theta$

$$f'(\theta) = -\sin \frac{2}{3} \theta \left(\frac{2}{3}\right)$$

$$f'(\theta) = -\frac{2}{3} \sin \frac{2}{3} \theta$$

10. $f(t) = \sin \frac{3}{4} t$

$$f'(t) = \cos \frac{3}{4} t \left(\frac{3}{4}\right)$$

$$f'(t) = \frac{3}{4} \cos \frac{3}{4} t$$

11. $y = 4 \sin 10x$

$$y' = 4 \cos 10x (10)$$

$$y' = 40 \cos 10x$$

12. $y = -\frac{1}{2} \cos 8x$

$$y' = -\frac{1}{2} (-\sin 8x) (8)$$

$$y' = 4 \sin 8x$$

13. $y = 14 \cos \frac{\theta}{7}$

$$y' = 14 (-\sin \frac{\theta}{7}) \left(\frac{1}{7}\right)$$

$$y' = -2 \sin \frac{\theta}{7}$$

14. $y = -4 \sin \frac{3\theta}{4}$

$$y' = -4 \cos \frac{3\theta}{4} \left(\frac{3}{4}\right)$$

$$\Rightarrow y' = -3 \cos \frac{3\theta}{4}$$

15. $f(t) = 8 \cos (4t - 9)$

$$f'(t) = 8 (-\sin (4t - 9)) (4)$$

$$f'(t) = -32 \sin (4t - 9)$$

16. $f(x) = \sin \left(\frac{2x+3}{5}\right)$

$$f'(x) = \cos \left(\frac{2x+3}{5}\right) \cdot \left(\frac{2}{5}\right)$$

$$f'(x) = \frac{2}{5} \cos \left(\frac{2x+3}{5}\right)$$

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

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

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

18. $f(x) = \sin 2x - 2 \sin x$

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

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

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

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19. $y = \cos^2 x$
 $y = (\cos x)^2$
 $y' = 2(\cos x)'(-\sin x)$
 $y' = -2 \sin x \cos x$

20. $y = \sin^5 x$
 $y = (\sin x)^5$
 $y' = 5(\sin x)^4 \cdot (\cos x)$
 $y' = 5 \sin^4 x \cos x$

21. $y = \sin(x^5)$
 $y' = \cos x^5 (5x^4)$
 $y' = 5x^4 \cos(x^5)$

22. $y = \cos(x^2)$
 $y' = -\sin(x^2)(2x)$
 $y' = -2x \sin(x^2)$

23. $y = -6 \sin(3x^2)$
 $y' = -6 \cos(3x^2)(6x)$
 $y' = -36x \cos(3x^2)$

24. $y = 5 \cos^2 3x$
 $y = 5(\cos 3x)^2$
 $y' = 10(\cos 3x)'(-\sin 3x)(3)$
 $y' = -30(\sin 3x)(\cos 3x)$

25. $y = -3 \cos(4x^3 - 3x)$
 $y' = 3 \sin(4x^3 - 3x)(12x^2 - 3)$
 $y' = 9(4x^2 - 1) \sin(4x^3 - 3x)$

26. $y = 10 \sin(x^2 - 5)$
 $y' = 10 \cos(x^2 - 5)(2x)$
 $y' = 20x \cos(x^2 - 5)$

27. $f(x) = \sin[(5x+3)^2]$

$f'(x) = \cos[(5x+3)^2](2(5x+3)(5))$

$f'(x) = 10(5x+3) \cos[(5x+3)^2]$

28. $f(x) = 11 \sin^2(5x+3)$

$f(x) = 11(\sin(5x+3))^2$

$f'(x) = 11(2)(\sin(5x+3))(\cos(5x+3))(5)$

$f'(x) = 110(\sin(5x+3))(\cos(5x+3))$

29. $f(x) = e^{\cos 3x}$

$f'(x) = e^{\cos 3x} \cdot (-\sin 3x)(3)$

$f'(x) = -3 \sin 3x e^{\cos 3x}$

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$$30. \quad f(x) = 4e^{6\sin x}$$

$$f'(x) = 4e^{6\sin x} \cdot 6\cos x$$

$$f'(x) = 24\cos x e^{6\sin x}$$

$$31. \quad f(x) = 4\ln(\cos x)$$

$$f'(x) = 4 \left(\frac{1}{\cos x} \right) (-\sin x)$$

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

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

$$32. \quad f(x) = -2\ln(\sin 7x)$$

$$f'(x) = -2 \left(\frac{1}{\sin 7x} \right) \cos 7x (7)$$

$$f'(x) = -\frac{14 \cos 7x}{\sin 7x}$$

$$f'(x) = -14 \cot 7x$$

$$33. \quad f(x) = \ln(\sin^2 x)$$

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

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

$$f'(x) = 2 \cot x$$

$$34. \quad f(x) = \ln(e^{\cos 11x})$$

$$f(x) = \cos 11x$$

$$f'(x) = -\sin 11x (11)$$

$$f'(x) = -11 \sin 11x$$

$$35. \quad y = x \sin x$$

$$y' = (1) \sin x + x \cos x$$

$$y' = \sin x + x \cos x$$

$$36. \quad y = \theta^2 \cos 2\theta$$

$$y' = 2\theta \cos 2\theta + \theta^2 (-\sin 2\theta)(2)$$

$$y' = 2\theta (\cos 2\theta - \theta \sin 2\theta)$$

$$37. \quad y = x^3 \sin(x^3)$$

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

$$y' = 3x^2 \sin(x^3) + 3x^5 \cos(x^3)$$

$$y' = 3x^2 [\sin(x^3) + x^3 \cos(x^3)]$$

$$38. \quad y = x^3 \cos^3(x^3) = x^3 (\cos x^3)^3$$

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

$$y' = 3x^2 \cos^3(x^3) - 9x^5 \cos^2(x^3) \sin(x^3)$$

$$y' = 3x^2 \cos^2(x^3) [\cos(x^3) - 3x^3 \sin(x^3)]$$

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39. $y = \frac{3x}{\cos x}$

$$y' = \frac{\cos x(3) - (3x)(-\sin x)}{\cos^2 x}$$

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

40. $y = \frac{2 \sin 2x}{x+3}$

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

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

41. $y = -6 \sqrt{\sin 8x}$

$$y = -6 (\sin 8x)^{1/2}$$

$$y' = -3 (\sin 8x)^{-1/2} \cdot (\cos 8x)(8)$$

$$y' = \frac{-24 (\cos 8x)}{\sqrt{\sin 8x}}$$

42. $y = \sqrt[3]{\cos^2 9x}$

$$y = (\cos^2 9x)^{1/3}$$

$$y' = \frac{2}{3} (\cos 9x)^{-2/3} (-\sin 9x)(9)$$

$$y' = \frac{-6 (\sin 9x)}{\sqrt[3]{\cos 9x}}$$

43. $f(x) = \frac{\sin t}{\cos 2t}$

$$f'(x) = \frac{\cos 2t(\cos t) - (\sin 2t)(2)(\sin t)}{\cos^2 2t}$$

$$= \frac{\cos t \cos 2t + 2 \sin t \sin 2t}{\cos^2 2t}$$

44. $f(x) = 3 \sin 5$

$$f'(x) = 0 \text{ (constant)}$$

45. $f(x) = \cos(e^4)$

$$f'(x) = 0 \text{ (constant)}$$

46. $f(\theta) = \sin^2(e^{2\theta})$

$$f(\theta) = (\sin e^{2\theta})^2$$

$$f'(\theta) = 2(\sin e^{2\theta})(\cos e^{2\theta})e^2$$

$$f''(\theta) = 4(e^{2\theta})(\sin e^{2\theta})(\cos e^{2\theta})$$

47. $f(r) = \sin r \cos r$

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

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

49. $y = \sin^2 x + \cos^2 x$

$$y = 1$$

$$y' = 0$$

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

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

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

50. $y = \sqrt{x} \sin 2x$

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

$$y' = \frac{1}{2} x^{-1/2} (\sin 2x + 4x \cos 2x)$$

$$y' = \frac{(\sin 2x + 4x \cos 2x)}{2\sqrt{x}}$$