MAT 270 - Derivative Practice II

Find the derivative of the following functions.

1. $f(x) = (3x^2 - 4)^5$

$f'(x) = 5(3x^2 - 4)^4 (6x) = 30x(3x^2 - 4)^4$

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

$f'(x) = 6x(2^{3x}) + 9x^2 (2^{3x})(\ln 2)$

3. $f(x) = e^{2x-1}(3x+4)^3$

$f'(x) = e^{2x-1}(3(3x+4)^2(3)) + 2e^{2x-1}(3x+4)^3 = 9e^{2x-1}(3x+4)^2 + 2e^{2x-1}(3x+4)^3$

4. $g(x) = \dfrac{e^{x^2}}{(2x-1)^3}$

$g'(x) = \dfrac{2xe^{x^2}(2x-1)^3 - 6e^{x^2}(2x-1)^2}{(2x-1)^6}$

5. $g(x) = (e^{2x} + x) + (3x^2 - 2x + x)^4$

$g'(x) = 2e^{2x} + 1 + 4(3x^2 - 2x + x)^3 (6x - 2 + 1) = 2e^{2x} + 1 + 4(3x^2 - 2x + x)^3 (6x - 1)$

6. $f(x) = \dfrac{(2 - 3x^2)^5}{5x}$

$f'(x) = \dfrac{5(2-3x)^4(-3)(5x) - 5(2-3x)^5}{25x^2} = \dfrac{-75x(2-3x)^4 - 5(2-3x)^5}{25x^2}$

7. $y = \cos^3\left(\sqrt{x}\right)$

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

8. $y = \left(\frac{\cos x}{1-\sin x}\right)^2$

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

9. $y = \left(17x^2 - 5x\right)^{50}$

$$y' = 50\left(17x^2 - 5x\right)^{49}(34x - 5)$$

10. $y = e^{2x}(\sin(3x))$

$$y' = 2e^{2x}\sin 3x + 3e^{2x}\cos 3x$$

11. $y = \sqrt{\sin x}$

$$y' = \frac{\cos x}{2\sqrt{\sin x}}$$

12. $y = \frac{\tan x}{x^2 - 1}$

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

13. $y = \arcsin\left(x^2\right)$

$$y' = \frac{2x}{\sqrt{1-x^4}}$$

14. $y = \left(x^2+1\right)\arctan(x)$

$$y' = 2x\arctan x + 1$$

15. $y = [\arccos(x)]^3$

$$y' = -\frac{3(\arccos x)^2}{\sqrt{1-x^2}}$$

16. $y = \tan(6x)$

$$y' = 6\sec^2 6x$$

17. $y = \dfrac{\sin 2x}{\cos 2x}$

$$y' = 2\sec^2 2x$$

18. $y = \dfrac{\sin x}{x^2}$

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

19. $y = \tan(\sin x) + \frac{1}{\pi}$

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

20. $y = 3\cos(5x) + 3\sin(x^9)$

$y' = -15\sin 5x + 27x^8 \cos x^9$

21. $y = \sin^3(3x^2 - 2x + 1)$

$y' = 3\sin^2(3x^2 - 2x + 1)\cos(3x^2 - 2x + 1)(6x - 2)$

22. $y = x^2 \tan\left(\frac{1}{x}\right)$

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

23. $f(x) = \sin^2\left(\sqrt{x}\right)$

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

24. $g(x) = e^{3x}\cos(2x)$

$g'(x) = e^{3x}(3\cos 2x - 2\sin 2x)$

25. $y = \left[\arcsin\left(x^3\right)\right]^4$

$y' = 4\left[\arcsin\left(x^3\right)\right]^3\left(\dfrac{1}{\sqrt{1-\left(x^3\right)^2}}\right)\left(3x^2\right)$

26. $y = \tan\left(6x^2 - 1\right)$

$y' = 12x\sec^2\left(6x^2 - 1\right)$

27. $y = \sin(3)e^x$

$y' = e^x \sin 3$

28. $y = \dfrac{\sec^2 x - \tan^2 x}{x^3}$

$y' = -3x^{-4}$

29. $y = \dfrac{\cos x}{x^3}$

$y' = \dfrac{-x\sin x + 3\cos x}{x^4}$

30. $y = \sin\left(\sin\left(4x\right)\right) + \dfrac{1}{e}$

$y' = 4\cos 4x\left[\cos\left(\sin 4x\right)\right]$

31. $y = \cos^2\left(3x^2 - 7x\right)$

$y' = (14 - 12x)\cos\left(3x^2 - 7x\right)\sin\left(3x^2 - 7x\right)$

32. $y = x^3 \sin\left(\frac{1}{x}\right)$

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

33. $y = \cos^4\left(\sqrt{x}\right)$

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

34. $y = \frac{\tan x}{2x - 1}$

$y' = \frac{(2x-1)\sec^2 x - 2\tan x}{(2x-1)^2}$

35. $y = \sqrt[3]{\sin x - 1}$

$y' = \frac{\cos x}{3\sqrt[3]{(\sin x - 1)^2}}$

36. $y = (\sin x)e^{3x} + \pi^2$

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

37. $y = \dfrac{\pi}{e^{x} + e^{-x}}$

$y' = -\dfrac{\pi\left(e^{x} - e^{-x}\right)}{\left(e^{x} + e^{-x}\right)^{2}}$

38. $y = \dfrac{1}{7}\sin x - \dfrac{1}{6}\cos x$

$y' = \dfrac{1}{7}\cos x + \dfrac{1}{6}\sin x$

39. $y = \dfrac{\csc^{2} x - \cot^{2} x}{x}$

$y' = -\dfrac{1}{x^{2}}$

40. $y = \dfrac{\cos(9x)}{\sin(9x)}$

$y' = -9\csc^{2}(9x)$

41. $y = \sin(\tan x) + \dfrac{1}{37}$

$y' = \sec^{2} x \cos(\tan x)$

42. $y = 4x^{5}\tan\left(\dfrac{-1}{x}\right)$

$y' = 20x^{4}\tan\left(-\dfrac{1}{x}\right) - 4x^{3}\sec^{2}\left(-\dfrac{1}{x}\right)$