Derivative Practice III

Find the derivative of each of the following functions.

1. $y = x^2 2^x + \pi^2$

$y' = 2^x\left(2x + x^2 \ln 2\right)$

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

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

3. $y = \sqrt{10^{5-x}}$

$y' = \dfrac{1}{2}\left(10^{(5-x)}\right)^{\frac{-1}{2}}(\ln 10)(-1)$

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

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

5. $y = \arctan\left(e^x\right)$

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

6. $f(x)=\frac{4}{x}\cdot 3^{x^2-x}$

$f'(x)=\left(-4x^{-2}\right)\left(3^{x^2-x}\right)+\left(4x^{-1}\right)\left(3^{x^2-x}\right)(\ln 3)(2x-1)$

7. $g(x)=5^x+3x^7$

$g'(x)=5^x\ln 5+21x^6$

8. $f(x)=\arctan(-5x)$

$f'(x)=\frac{-5}{1+25x^2}$

9. $2y=x^2+\sin y$

$\frac{dy}{dx}=\frac{2x}{2-\cos y}$

10. $y=\arccos\left(x^3\right)$

$y'=\frac{-3x^2}{\sqrt{1-x^6}}$

11. $y = [\arcsin(x)]^4$

$$y' = \frac{4(\arcsin x)^3}{\sqrt{1-x^2}}$$

12. $f(x) = \arctan(-2x)$

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

13. $3y = x^3 + \cos y$

$$\frac{dy}{dx} = \frac{3x^2}{3+\sin y}$$

14. $y = e^{10x}\csc^{-1}(20x)$

$$y' = 10e^{10x}\left(\csc^{-1}(20x)\right) + 20e^{10x}\left(\frac{-1}{20x\sqrt{(20x)^2-1}}\right)$$

15. $y = \sec^{-1}(7x)$

$$y' = \frac{7}{7x\sqrt{(7x)^2-1}} = \frac{1}{x\sqrt{49x^2-1}}$$

16. $x\cos y + y\cos x = 1$

$$\frac{dy}{dx} = \frac{y\sin x - \cos y}{\cos x - x\sin y}$$

17. $\dfrac{y}{x-y} = x^2 + 1$

$$\frac{dy}{dx} = \frac{3x^2 - 2xy + 1}{x^2 + 2}$$

18. $x^2y^3 + 3y^2 = x - 4y$

$$\frac{dy}{dx} = \frac{1 - 2xy^3}{3x^2y^2 + 6y + 4}$$

19. $y\sqrt{x-1} + x\sqrt{y-1} = xy$

$$\frac{dy}{dx} = \frac{y - (y-1)^{\frac{1}{2}} - \dfrac{y}{2}(x-1)^{\frac{-1}{2}}}{(x-1)^{\frac{1}{2}} + \dfrac{x}{2}(y-1)^{\frac{-1}{2}} - x}$$

20. $2xy = \left(x^2 + y^2\right)^{\frac{3}{2}}$

$$\frac{dy}{dx} = \frac{3x\left(x^2 + y^2\right)^{\frac{1}{2}} - 2y}{2x - 3y\left(x^2 + y^2\right)^{\frac{1}{2}}}$$