45. $f(x) = \arctan\left(\frac{x}{a}\right)$

$$f'(x) = \frac{1/a}{1+(x/a)^2}$$

47. $g(x) = \frac{\arcsin(3x)}{x}$

$$g'(x) = \frac{(x)\left(\frac{3}{\sqrt{1-(3x)^2}}\right) - (\arcsin 3x)(1)}{x^2}$$

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

49. $h(t) = \sin(\arccos t)$

$$\frac{dh}{dt} = \cos(\arccos t) \cdot \frac{-1}{\sqrt{1-t^2}}$$

$$= -\frac{\cos(\arccos t)}{\sqrt{1-t^2}}$$

5ϕ. $y = x\arccos x - \sqrt{1-x^2}$

$$y' = (\arccos x)(1) + (x)\left(\frac{-1}{\sqrt{1-x^2}}\right) - \frac{1}{2}(1-x^2)^{-1/2} \cdot -2x$$

$$= \arccos x - \cancel{\frac{x}{\sqrt{1-x^2}}} + \cancel{\frac{x}{\sqrt{1-x^2}}} = \arccos x$$

53. $y = \frac{1}{2}\left(\frac{1}{2}\ln\frac{x+1}{x-1} + \arctan x\right) \overset{\text{Rewrite}}{=} \frac{1}{2}\left(\frac{1}{2}\ln x+1 - \frac{1}{2}\ln x-1 + \arctan x\right)$

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

$$= \frac{1}{2}\left(\frac{1}{2(x+1)} - \frac{1}{2(x-1)} + \frac{1}{1+x2}\right)$$

55. $y = x \arcsin x + \sqrt{1-x^2}$

$$\frac{dy}{dx} = (\arcsin x)(1) + (x)\left(\frac{1}{\sqrt{1-x^2}}\right) + \frac{1}{2}(1-x^2)^{-1/2} \cdot -2x$$

$$= \arcsin x + \cancel{\frac{x}{\sqrt{1-x^2}} - \frac{x}{\sqrt{1-x^2}}}^{\,0}$$

$$= \arcsin x$$

57. $y = 8\sin^{-1}(x/4) - \dfrac{x\sqrt{16-x^2}}{2}$ Rewrite $= 8\sin^{-1}(x/4) - \left(\frac{1}{2}x\right)\left(\sqrt{16-x^2}\right)$

$$y' = 8 \cdot \frac{1/4}{\sqrt{1-(x/4)^2}} - \left(\sqrt{16-x^2}\right)(1/2) + (1/2\,x)\left(\frac{1}{2}(16-x^2)^{-1/2} \cdot -2x\right)$$

$$= \frac{2}{\sqrt{1-(x/4)^2}} - \frac{\sqrt{16-x^2}}{2} - \frac{x^2}{2\sqrt{16-x^2}}$$

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61. point: $\boxed{\left(\frac{1}{2}, \frac{\pi}{3}\right)}$

slope: $y' = 2 \cdot \dfrac{1}{\sqrt{1-x^2}}$

$$y'(\tfrac{1}{2}) = 2 \cdot \frac{1}{\sqrt{1-(1/2)^2}} = \frac{2}{\sqrt{3/4}} = \boxed{\frac{4}{\sqrt{3}}}$$

$$y - \pi/3 = \frac{4}{\sqrt{3}}\left(x - \frac{1}{2}\right)$$

62. point: $\boxed{\left(-\sqrt{2}/2, 3\pi/8\right)}$

Slope: $y' = \frac{1}{2} \cdot \dfrac{-1}{\sqrt{1-x^2}}$

$$y'(-\sqrt{2}/2) = \frac{1}{2} \cdot \frac{-1}{\sqrt{1-(\sqrt{2}/2)^2}} = \frac{1}{2} \cdot \frac{-1}{\sqrt{1/2}} = \frac{1}{2} \cdot \frac{-\sqrt{2}}{1} = \boxed{\frac{-\sqrt{2}}{2}}$$

$$y - \frac{3\pi}{8} = \frac{-\sqrt{2}}{2}\left(x + \sqrt{2}/2\right)$$

63. point: $\boxed{(2, \pi/4)}$

slope: $y' = \dfrac{1/2}{1+(x/2)^2}$

$$y'(2) = \frac{1/2}{1+(2/2)^2} = \frac{1/2}{1+1} = \boxed{\frac{1}{4}}$$

$$y - \pi/4 = 1/4\,(x-2)$$

65. point: $\boxed{(1, 2\pi)}$

Slope: $y' = (\arccos(x-1))(4) + (4x)\left(\dfrac{-1}{\sqrt{1-(x-1)^2}}\right)$

$$y'(1) = (\arccos 0)(4) + (4 \cdot 1)\left(\frac{-1}{\sqrt{1-(0)^2}}\right)$$

$$= (\pi/2)(4) - 4 = \boxed{2\pi - 4}$$

$$y - 2\pi = (2\pi - 4)(x-1)$$

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75. point: $\boxed{(-\pi/4, 1)}$

slope: $2x + (\arctan y)(1) + (x)\left(\dfrac{1}{1+y^2} \cdot \dfrac{dy}{dx}\right) = \dfrac{dy}{dx}$

$$2x + \arctan y = \frac{dy}{dx} - \frac{x}{1+y^2}\frac{dy}{dx}$$

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

$$\frac{dy}{dx} = \frac{2x + \arctan y}{1 - \frac{x}{1+y^2}}$$

$$\left.\frac{dy}{dx}\right|_{(-\pi/4, 1)} = \frac{2(-\pi/4) + \arctan(1)}{1 - \frac{-\pi/4}{1+(1)^2}} = \frac{-\frac{\pi}{2} + \frac{\pi}{4}}{\frac{2+\pi/4}{2}} = \frac{\frac{\pi}{4}}{\frac{2+\frac{\pi}{4}}{2}} = \boxed{\frac{\pi}{4+\pi/2}}$$

$$y - 1 = \frac{\pi}{4+\pi/2}\left(x + \pi/4\right)$$

76. point: $\boxed{(0,0)}$

slope:

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

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

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

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

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

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

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

$$\left.\frac{dy}{dx}\right|_{(0,0)} = \frac{0 + 1 + 0}{0 - 1 - 0} = \frac{1}{-1} = \boxed{-1}$$

$$y - 0 = -1(x - 0)$$