p. 171 1, 5, 7, 9, 11, 17, 55, 57, 65, 67, 71, 73, 83

1) $x^2 + y^2 = 9$

$2x + 2y\left(\frac{dy}{dx}\right) = 0$

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

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

5) $x^3 - xy + y^2 = 7$

$x^3 - x\left(\frac{dy}{dx}\right) - y + 2y\left(\frac{dy}{dx}\right) = 0$

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

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

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

7) $x^3y^3 - y = x$

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

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

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

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

9) $xe^y - 10x + 3y = 0$

$x \cdot e^y\left(\frac{dy}{dx}\right) + e^y - 10 + 3\left(\frac{dy}{dx}\right) = 0$

$xe^y\left(\frac{dy}{dx}\right) + 3\left(\frac{dy}{dx}\right) = 10 - e^y$

$\frac{dy}{dx}(xe^y + 3) = 10 - e^y$

$$\frac{dy}{dx} = \frac{10 - e^y}{xe^y + 3}$$

11) $\sin x + 2\cos 2y = 1$

$\cos x - 4\sin 2y\left(\frac{dy}{dx}\right) = 0$

$-4\sin 2y\left(\frac{dy}{dx}\right) = -\cos x$

$$\frac{dy}{dx} = \frac{\cos x}{4\sin 2y}$$

17) $x^2 - 3\ln y + y^2 = 10$

$2x - \frac{3}{y}\left(\frac{dy}{dx}\right) + 2y\left(\frac{dy}{dx}\right) = 0$

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

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

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

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

55) $x^2 - y^2 = 36$

$2x - 2y\left(\frac{dy}{dx}\right) = 0$

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

$\frac{dy}{dx} = \frac{x}{y}$

$\frac{d^2y}{dx^2} = \frac{y\cdot 1 - x\cdot\frac{dy}{dx}}{y^2}$

$\frac{d^2y}{dx^2} = \frac{\left(y - \frac{x^2}{y}\right)y}{(y^2)y}$

$$\frac{d^2y}{dx^2} = \frac{y^2 - x^2}{y^3}$$

57) $y^2 = x^3$

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

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

$\frac{d^2y}{dx^2} = \frac{2y\cdot 6x - 3x^2\cdot 2\left(\frac{dy}{dx}\right)}{(2y)^2}$

$\frac{d^2y}{dx^2} = \frac{\left(12xy - 6x^2\left(\frac{3x^2}{2y}\right)\right)2y}{(4y^2)2y}$

$\frac{d^2y}{dx^2} = \frac{24xy^2 - 18x^4}{8y^3}$

$$\frac{d^2y}{dx^2} = \frac{12xy - 9x^4}{4y^3}$$

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

$\ln y = 2\ln x + \frac{1}{2}\ln(3x-2) - 2\ln(x+1)$

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

$\frac{dy}{dx} = \left[\frac{2}{x} + \frac{3}{2(3x-2)} - \frac{2}{(x+1)}\right]\frac{x^2\sqrt{3x-2}}{(x+1)^2}$ ← you can stop here!

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

65) $y = x\sqrt{x^2+1} = x(x^2+1)^{\frac{1}{2}}$

$\ln y = \ln x + \frac{1}{2}\ln(x^2+1)$

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

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

$\frac{dy}{dx} = \left[\frac{1}{x} + \frac{x}{x^2+1}\right]x\sqrt{x^2+1}$ ← you can stop here

$\frac{dy}{dx} = \frac{\sqrt{x^2+1}}{1} + \frac{x^2}{\sqrt{x^2+1}}$ (multiply by $\frac{\sqrt{x^2+1}}{\sqrt{x^2+1}}$)

$$\frac{dy}{dx} = \frac{x^2+1+x^2}{\sqrt{x^2+1}} = \frac{2x^2+1}{\sqrt{x^2+1}}$$

71) $y = x^{\frac{2}{x}} = x^{2x^{-1}}$

$\ln y = \frac{2}{x}\ln x$

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

$\frac{1}{y}\left(\frac{dy}{dx}\right) = \left[\frac{2}{x^2} - \frac{2\ln x}{x^2}\right] x^{\frac{2}{x}}$

$\frac{dy}{dx} = \left(\frac{2-2\ln x}{x^2}\right) x^{\frac{2}{x}}$ ← you can stop here!

$\frac{dy}{dx} = \frac{2-2\ln x}{x^{2-2/x}}$

73) $y = (x-2)^{x+1}$

$\ln y = (x+1)\ln(x-2)$

$\frac{1}{y}\left(\frac{dy}{dx}\right) = \left[(x+1)\cdot\frac{1}{x-2} + \ln(x-2)\cdot 1\right]\cdot y$

$\frac{dy}{dx} = \left[\frac{x+1}{x-2} + \ln(x-2)\right](x-2)^{x+1}$ ← you can stop here!

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

83) → answers vary