7.6 Separation of Variables (General Solutions) Solutions **Practice**

Calculus

Find the general solution of each differential equation.

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

$y\,dy = 3x^2\,dx$

$\frac{1}{2}y^2 = x^3 + C$

$y^2 = 2x^3 + C$

$$y = \pm\sqrt{2x^3 + C}$$

2. $\frac{dy}{dx} = 8x^2y$

$\frac{1}{y}\,dy = 8x^2\,dx$

$\ln|y| = \frac{8}{3}x^3 + C$

e e

$y = e^{\frac{8}{3}x^3 + C}$

$$y = Ce^{\frac{8}{3}x^3}$$

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

$y^{-2}\,dy = e^x\,dx$

$-y^{-1} = e^x + C$

$\frac{1}{y} = -e^x + C$

$$y = \frac{1}{-e^x + C}$$

4. $\frac{dy}{dx} = -2x(y-3)$

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

$\ln|y-3| = -x^2 + C$

e e

$y - 3 = e^{-x^2 + C}$

$$y = \frac{C}{e^{x^2}} + 3$$

5. $\frac{dy}{dx} = y\cos x$

$\frac{1}{y}\,dy = \cos x\,dx$

$\ln|y| = \sin x + C$

$e \qquad e$

$y = e^{\sin x + C}$

$$y = Ce^{\sin x}$$

6. $\frac{dy}{dx} = (y+5)(x+2)$

$\frac{1}{y+5}\,dy = (x+2)\,dx$

$\ln|y+5| = \frac{x^2}{2} + 2x + C$

$e \qquad e$

$y+5 = e^{\frac{x^2}{2}+2x+C}$

$$y = Ce^{\frac{x^2}{2}+2x} - 5$$

7. $\frac{dy}{dx} = e^{x-y}$

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

$e^y\,dy = e^x\,dx$

$e^y = e^x + C$

$\ln(e^y) = \ln(e^x + C)$

$$y = \ln(e^x + C)$$

8. $\frac{dy}{dx} = \frac{2x}{e^{2y}}$

$e^{2y}\,dy = 2x\,dx$

$\frac{1}{2}e^{2y} = x^2 + C$

$e^{2y} = 2x^2 + C$

$2y = \ln(2x^2 + C)$

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

$$y = \ln\left(\sqrt{2x^2 + C}\right)$$

No Test Prep. We will wait for our next lesson when we can use *particular solutions* with separation of variables.