

Worksheet: Separable Differential Equations

1. Find the general solutions for the following separable differential equations.

a. $y^2 \frac{dy}{dx} = 6x - x^3$

b. $\frac{dy}{dx} = 5x^{2/3}y^4$

Use the power rule:
 $\int x^n = \frac{1}{n+1}x^{n+1} + C$
 for $n \neq -1$.

c. $\frac{dy}{dx} = \sqrt{x}e^{4y}$

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

Use the formula
 $\int e^{kx} dx = \frac{1}{k}e^{kx} + C$

2. Find the particular solutions for the following separable differential equations.

(These are the equations from (1a) and (1b) above.)

a. $y^2 \frac{dy}{dx} = 6x - x^3$

b. $\frac{dy}{dx} = 5x^{2/3}y^4$

Use the given values
 of x and y to solve
 for the constant.

$y = 3$ when $x = 0$

$y = 8$ when $x = 1$

3. Find the following antiderivatives.

a. $\int \frac{dy}{4y}$

b. $\int \frac{dy}{1-10y}$
(let $u = 1 - 10y$)

Use the formula
 $\int x^{-1} dx = \ln|x| + C$.

4. Find the general solutions for the following separable differential equations.

a. $\frac{dy}{dx} = xy$

b. $\frac{dy}{dx} = 3x - 5xy$

(factor out an x)

5. Find the particular solution to the equation

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

if $y = 4$ when $x = 0$.