7. Differential Equations

7.1 Verifying Solutions to DE's

Verify the following functions are solutions to the given differential equation:

1. $y = Ce^{-6x^2}; \qquad y' = -12xy$

2. $2x^2 - y^2 = c; \quad yy' - 2x = 0$

3. $y = 4e^{3x}\sin x + Ce^{3x}; \quad y' - 3y = 4e^{3x}\cos x$

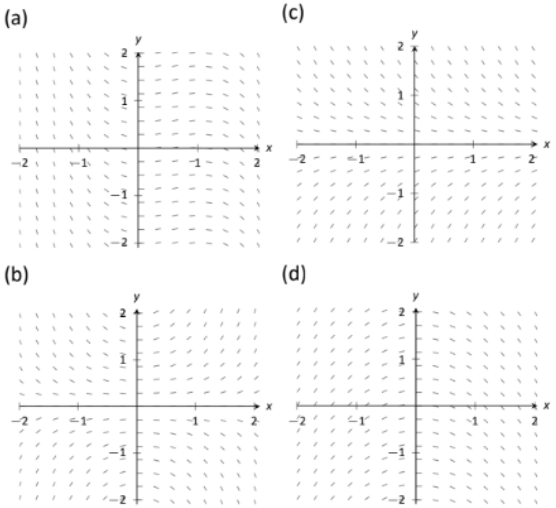
7.2 Slope Fields

Sketch the slope field of the differential equation with x ranging from -2 to 2.

1. $y' = y - x$

2. $y' = \sin(\pi y)$

Match the slope field with the given differential equation



3. $y' = xy$

4. $y' = -y$

5. $y' = -x$

6. $y' = x(1 - x)$

Sketch the slope field and draw the solution going through the given initial value.

7. $y' = \dfrac{y}{x} - y,$ with $y(0.5) = 1$

8. $y' = y^2 - 3y + 2,$ with $y(0) = 2$

9. $y' = y\tan x,$ with $y(0) = 1$

7.3 Separable of Variables

Find the general solution to the differential equation using separation of variables. If it is not possible to separate the variables, state that is the case.

1. $y' = y^2 - y$

2. $(y + 3)y' + (\ln x)y' - x\sin y = (y + 3)\ln x$

3. $y' = x - y$

4. $y' + 1 - y^2 = 0$

5. $xy' = 4y$

6. $e^x yy' = e^{-y} + e^{-2x-y}$ (Note: Setup the integral only)

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

Created by Allen Tsao (Bothell STEM Coach)
Questions are derived from APEX Calculus textbook and OpenStax Calculus Volume 1.

Find the particular solution to the initial value problem using separation of variables.

8. $y' = \dfrac{\sin x}{\cos y}$; with $y(0) = \dfrac{\pi}{2}$

9. $y' = \dfrac{2x}{y + x^2 y}$; with $y(0) = -4$

10. $y' = \dfrac{x \ln (x^2 + 1)}{y - 1}$, with $y(0) = 2$

11. $y' = \left(\cos^2 x\right)\left(\cos^2 2y\right)$; with $y(0) = 0$

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