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

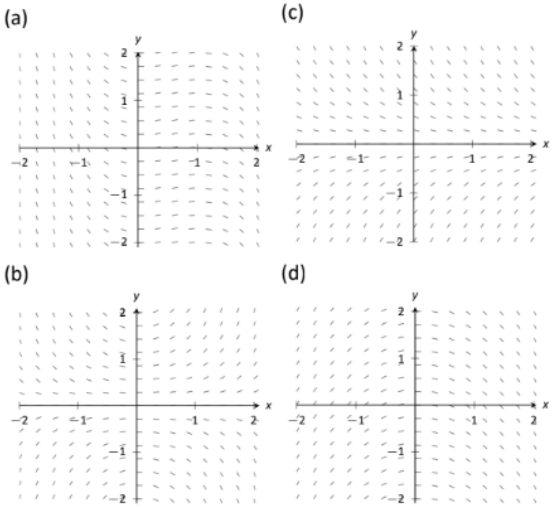
7.2 Slope Fields

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)

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

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

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. $y' = \dfrac{2x}{y+x^2y}$, 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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