

Calculus BC

Section 6.1 - Slope Fields and Euler's Method

- Obj:
- To sketch slope fields
 - To use slope fields to approximate solutions of differential equations.
 - To use initial conditions to find particular solutions of differential equations.
 - To use Euler's Method to approximate solutions of differential equations.

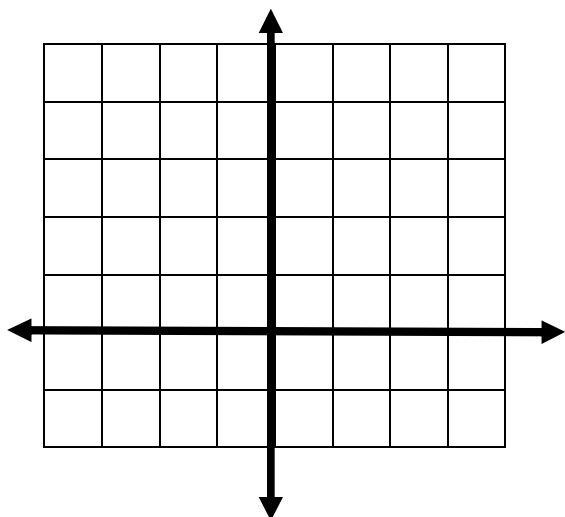
1. Given the differential equation $x + y' - 3y = 0$.

a) verify that $y = Cx^3$ is a **general solution**.

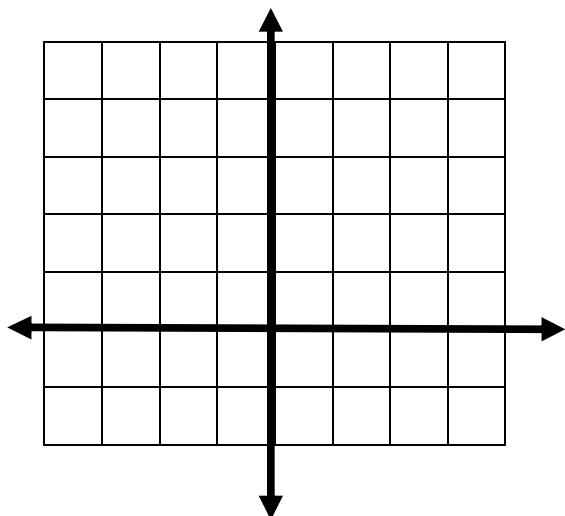
$$x + y' - 3y = 0$$

b) Find the **particular solution** given the initial condition $y(-3) = 2$.

2. Sketch the slope field for the differential equation $y' = 2x$



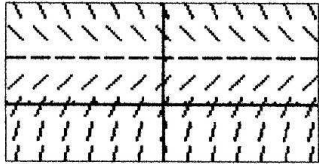
3. Sketch the slope field for the differential equation $y' = x + y$.



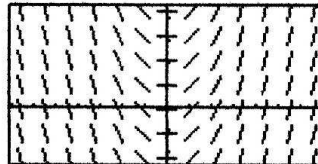
4. Match the slope field with the differential equation.

Match the slope fields with their differential equations.

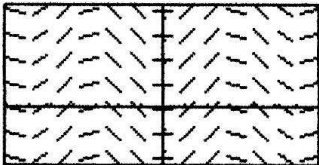
(A)



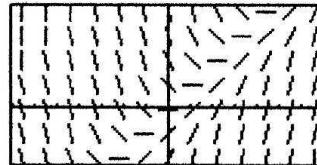
(B)



(C)



(D)



7. $\frac{dy}{dx} = \sin x$

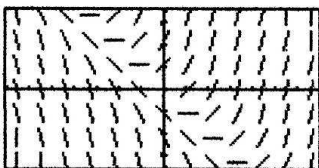
8. $\frac{dy}{dx} = x - y$

9. $\frac{dy}{dx} = 2 - y$

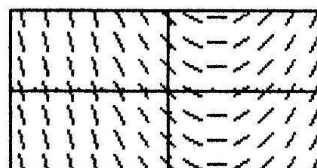
10. $\frac{dy}{dx} = x$

Match the slope fields with their differential equations.

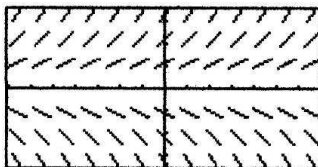
(A)



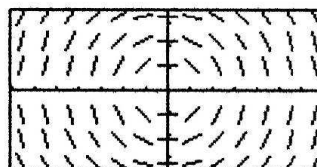
(B)



(C)



(D)



11. $\frac{dy}{dx} = 0.5x - 1$

12. $\frac{dy}{dx} = 0.5y$

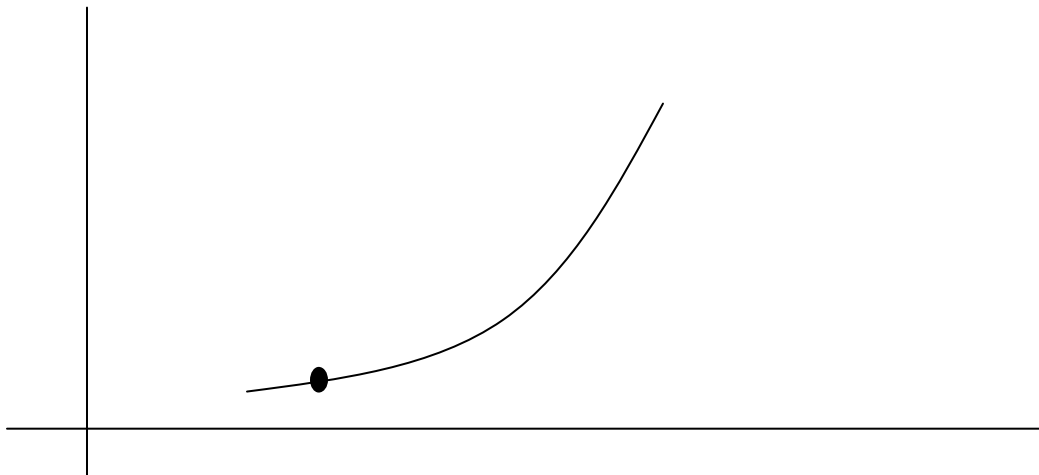
13. $\frac{dy}{dx} = -\frac{x}{y}$

14. $\frac{dy}{dx} = x + y$

Euler's Method-

A numerical process to approximate the particular solution of the differential equation $\frac{dy}{dx} = y'(x, y)$ with initial value (x_0, y_0) .

If we use the tangent line through the point P_0 to approximate the actual curve, the approximation would be good from $x = x_0$ to $x = x_0 + h$ provided that h is small. But do not perform too many approximations because this will lead to errors.



$$x_0 = x_0$$

$$y_0 = y_0$$

$$x_1 = x_0 + h$$

$$y_1 = y_0 +$$

$$x_2 = x_1 + h$$

$$y_2 = y_1 +$$

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$$x_{n+1} =$$

$$y_{n+1} = y_n +$$

5. Use Euler's method to approximate $y(1)$ for $y' = x + y$ with $y(0) = 1$ using $h = \frac{1}{4}$ (that is, find y when $x=1$)

$$x_0 =$$

$$y_0 =$$

$$x_1 =$$

$$y_1 =$$

$$x_2 =$$

$$y_2 =$$

C6H1 p. 411 # 4, 5, 12, 23, 27, 35, 41-51 odd, 57-60, 63, 65, 67, 73 - find $y(0.5)$, 75 - find $y(1)$ using $h=0.25$, 89-92