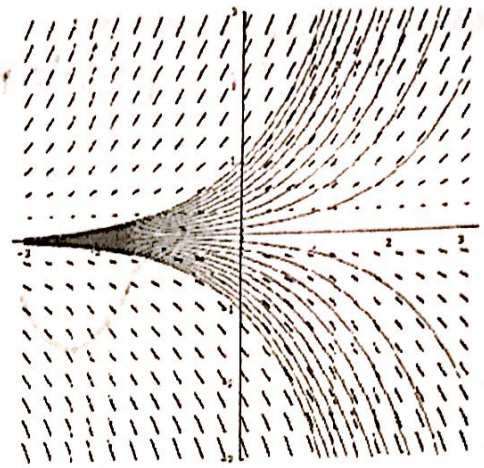
Name: Key



Calculus BC Unit 4 Homework Problems

Day 1

1. Match each slopefield below with the proper differential equation from the set. Find the general solution of each differential equation. NOTE: The particular solution that goes through (0,0) has been sketched in.

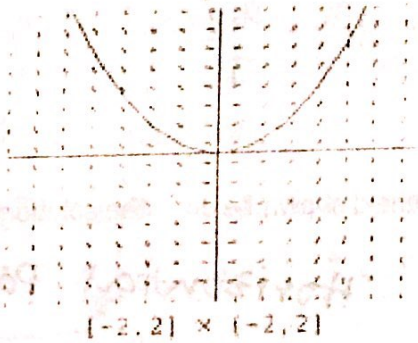
(A) $y' = \cos x$ III

(B) $\frac{dy}{dx} = 2x$ I

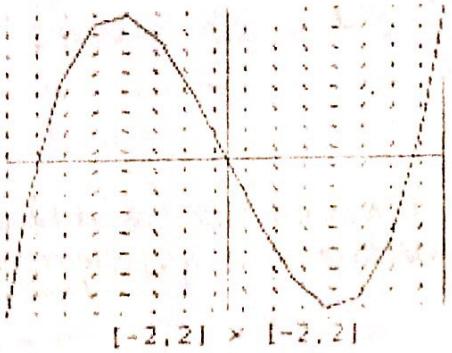
(C) $\frac{dy}{dx} = 3x^2 - 3$ II

(D) $y' = -\frac{\pi}{2}$ IV

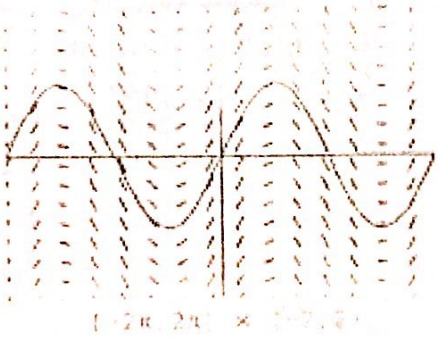
~~I.~~



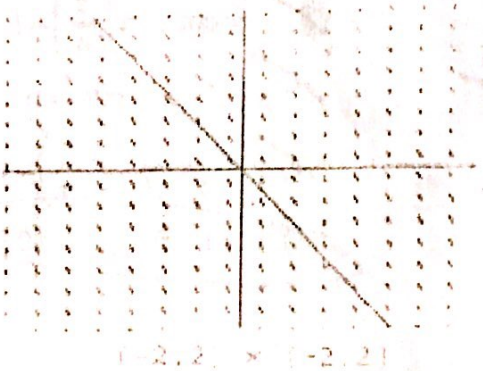
~~II.~~



~~III.~~

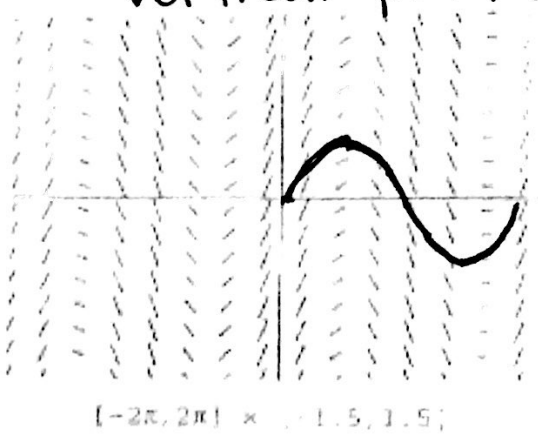


~~IV.~~



2. The slopefield shown at the right is for which of the following differential equations?

vertical pattern



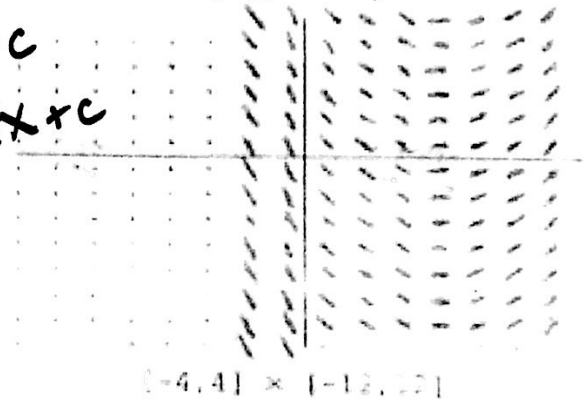
$[-2\pi, 2\pi] \times [-1.5, 1.5]$

(A) $y' = x+1$
(B) $y' = \sin x$
(C) $y' = -\sin x$
(D) $y' = \cos x$ ← derivative of graph
(E) $y' = -\cos x$

D

3. The slopefield shown at the right is for which of the following differential equations?

Vertical pattern



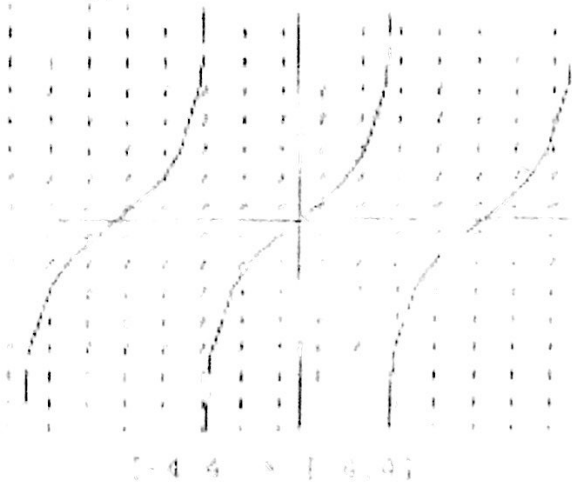
$[-4, 4] \times [-12, 12]$

(A) $y' = 2x$ *
(B) $y' = 2x-4$ ⇝ $y = x^2 - 4x + c$
(C) $y' = 4-2x$ ⇝ $y = -x^2 + 4x + c$
(D) $y' = y$
(E) $y' = x+y$

B

4. A solution curve has been superimposed on the slopefield shown below. The solution is for which of the following differential equations?

Horizontal Pattern



$[-4, 4] \times [-6, 6]$

(A) $y' = \tan x,\ y(0) = 0$
(B) $y' = \cot x,\ y\left(\frac{\pi}{4}\right) = 1$
(C) $y' = 1+x^2,\ y(0) = 0$
(D) $y' = \frac{1}{1+x^2},\ y\left(\frac{\pi}{4}\right) = 1$
(E) $y' = 1+y^2,\ y(0) = 0$

E

Solve the initial value problems:

5. $\frac{dy}{dx} = 2x - 1,\ y(2) = 0$

$y = x^2 - x + C$

$0 = 4 - 2 + C \rightarrow C = -2$

$\boxed{y = x^2 - x - 2}$

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

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

$1 = -1/2 + 2 + C \rightarrow C = -1/2$

$\boxed{y = \frac{-1}{x} + \frac{x}{2} - \frac{1}{2}}$

7. $\frac{dy}{dx} = \sec^2 x,\ y(\pi/4) = -1$

$y = \tan x + C$

$-1 = 1 + C \rightarrow C = -2$

$\boxed{y = \tan x - 2}$

8. $\frac{dy}{dx} = x^{-2/3},\ y(-1) = -5$

$y = 3x^{1/3} + C$

$-5 = -3 + C \rightarrow C = -2$

$\boxed{y = 3\sqrt[3]{x} - 2}$

9. $\frac{dy}{dx} = 9x^2 - 4x + 5,\ y(-1) = 0$

$y = 3x^3 - 2x^2 + 5x + C$

$0 = -3 - 2 - 5 + C \rightarrow C = 10$

$\boxed{y = 3x^3 - 2x^2 + 5x + 10}$

10. $\frac{dy}{dx} = \cos x + \sin x,\ y(\pi) = 1$

$y = \sin x - \cos x + C$

$1 = 0 - 1 + C \rightarrow C = 2$

$\boxed{y = \sin x - \cos x + 2}$

11. $\frac{dy}{dt} = 2e^{-t},\ y(\ln 2) = 0$

$y = -2e^{-t} + C$

$0 = \frac{-2}{e^{\ln 2}} + C \rightarrow C = 1$

$\boxed{y = \frac{-2}{e^t} + 1}$

12. $\frac{dy}{dx} = \frac{1}{x},\ y(e^3) = 0$

$y = \ln|x| + C$

$0 = \ln e^3 + C \rightarrow C = -3$

$\boxed{y = \ln|x| - 3}$

13. $\frac{d^2y}{d\theta^2} = \sin\theta,\ y(0) = -3,\ y'(0) = 0$

$\frac{dy}{d\theta} = -\cos\theta + C$

$0 = -1 + C \rightarrow C = 1$

$y' = -\cos\theta + 1$

$y = -\sin\theta + \theta + D$

$-3 = 0 + 0 + D \rightarrow D = -3$

$\boxed{y = -\sin\theta + \theta - 3}$