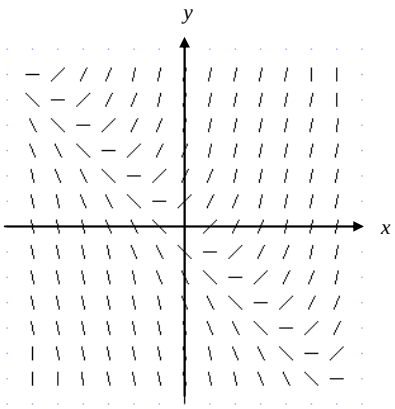
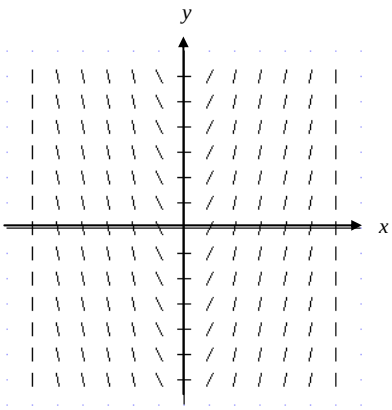
AP Calculus
6.1 Worksheet

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

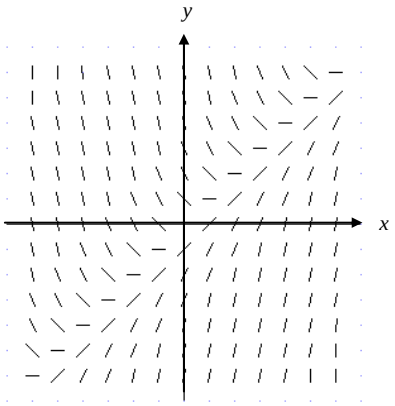
1. Match the six slope fields shown below to their differential equations. Explain each choice.

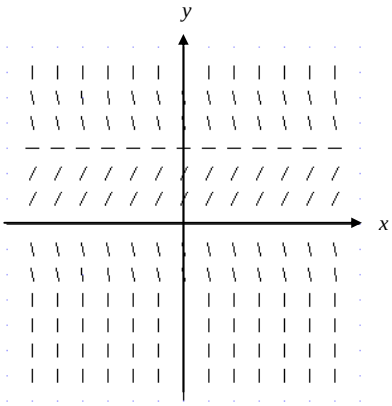




$\frac{dy}{dx} = x - y$

$\frac{dy}{dx} = 2x$

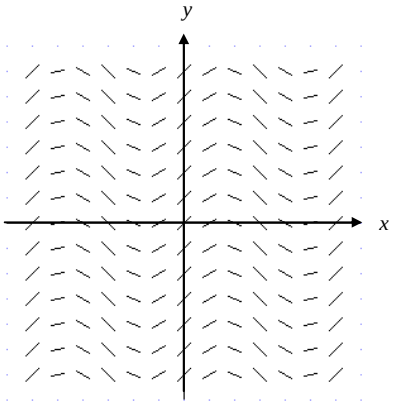


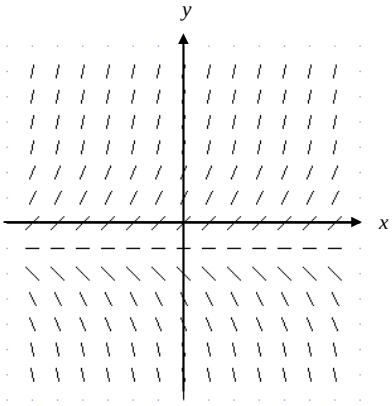


$\frac{dy}{dx} = 1 + y$

$\frac{dy}{dx} = \cos x$

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

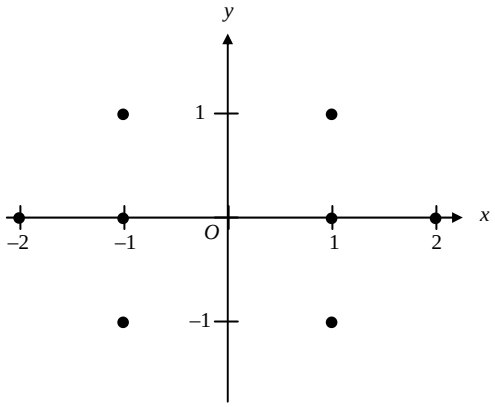




$\frac{dy}{dx} = y(3 - y)$

2. [No Calculator] Consider the differential equation $\frac{dy}{dx} = \frac{1+y}{x}$, where $x \neq 0$.

a) On the axes provided, sketch a slope field for the given differential equation at the eight points indicated.



If the solution to a differential equation is continuous then an initial condition pins down the solution on the entire domain (restricted by the differential equation and the general solution). However, if the solution is NOT continuous, then the initial condition only pins down the continuous piece of the solution curve that passes through the given point.

b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(-1) = 1$ and state its domain.

3. Let f be a function such that $f''(x) = 6x + 12$.

a) Find $f(x)$ if the graph of f is tangent to the line $4x - y = 5$ at the point $(0, -5)$.

b) Find the average value of $f(x)$ on the closed interval $[-1, 1]$.

4. Solve the initial value problem $\frac{d^2y}{dx^2} = 2 - 6x$ given that $y(0) = 1$ and $y'(0) = 4$.

5. Let $F(x)$ be an antiderivative of $\frac{(\ln x)^3}{x}$. If $F(1) = 0$, then $F(9) = ?$ ***Justify your response***. (calculator ok)

A) 0.048

B) 0.144

C) 5.827

D) 23.308

E) 1,640.250

6. The graph of f is shown in the figure below. If $\int_1^3 f(x)\,dx = 2.3$ and $F'(x) = f(x)$, then $F(3) - F(0) = ?$ ***Justify your response without using any calculator***.

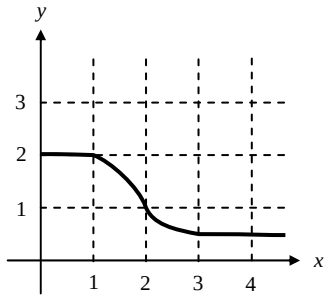
A) 0.3

B) 1.3

C) 3.3

D) 4.3

E) 5.3



6. Let $f(x) = \int_0^{x^2} \sin t\,dt$. At how many points in the interval $\left[0, \sqrt{\pi}\right]$ does the instantaneous rate of change of f equal the average rate of change of f on that interval? ***Justify your response***. (calculator ok)

A) Zero

B) One

C) Two

D) Three

E) Four

7. Complete the following questions from the textbook: Page 327: #1, 3, 5, 6, 12, 15, 18, 31, 34
(Want more practice? … try the following from the textbook: page 327: #2, 4, 11, 13, 14, 16, 17, 19, 20)