AP Calculus
In-Class Review

1. Given, $\frac{dy}{dx} = y - x$, determine each of the following and justify your answers.

a. Is $y(x)$ increasing or decreasing at the point $(3,-5)$?

b. Use Linear Approximation to estimate the value of $y(3.1)$.

c. Is the value of $y(3.1)$ an under or over estimate of the actual value?

2. Given, $\frac{dy}{dx} = -\frac{y}{x}$, determine each of the following and justify your answers.

a. Is $y(x)$ increasing or decreasing at the point $(-1,\ 1)$?

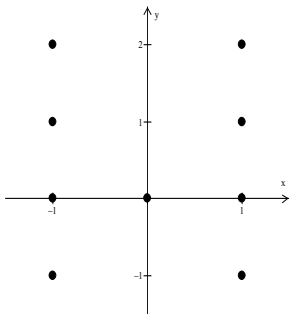
b. Use Linear Approximation to estimate the value of $y(-0.9)$.

c. Is the value of $y(-0.9)$ an under or over estimate of the actual value?

3. Determine the equation of the solution curve to $\frac{dy}{dx} = 2x(1-3y)$ that satisfies $y(0)=1$.

4. Consider the differential equation $\frac{dy}{dx} = x^2(1-y)$.

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



b. Determine the equation of the line tangent to $y(x)$ at $(1,\ 3)$.

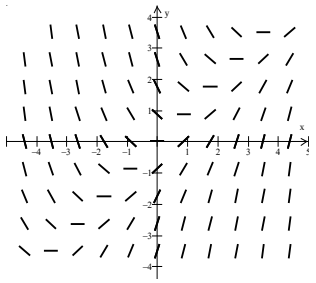
5. Below each of the given slope fields, indicate the **letter** corresponding to the solution curve, and the **number** corresponding to the differential equation that is represented by the slope field.

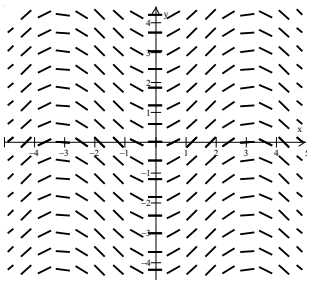
A. $y = \cos x$ **B**. $y = -\cos x$ **C**. $y = \sin x$ **D**. $y = -\sin x$

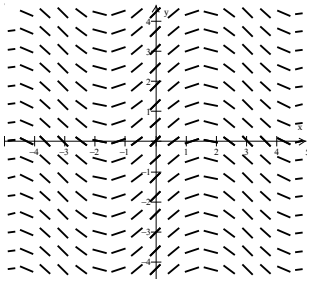
E. $y = \ln|x|$ **F**. $y = \frac{1}{x}$ **G**. *Equation not given*

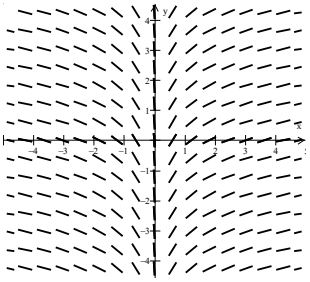
1. $\frac{dy}{dx} = \cos x$ **2**. $\frac{dy}{dx} = -\cos x$ **3**. $\frac{dy}{dx} = \sin x$ **4**. $\frac{dy}{dx} = -\sin x$

5. $\frac{dy}{dx} = \frac{1}{x}$ **6**. $\frac{dy}{dx} = \ln x$ **7**. $\frac{dy}{dx} = x - y$ **8**. $\frac{dy}{dx} = x + y$









6. The region, *R*, in the first quadrant, is enclosed by the $y-$axis and the graphs of $f(x) = \cos(x)$ and $g(x) = \sin(x)$. Set up the integrals and determine the volumes of the following:

a. Revolving *R* about the $x-$axis.

b. Revolving *R* about the line, $y = 3$.

7. The region, *R,* is enclosed by the graphs of $f(x) = \sqrt{x}$ and $g(x) = x^2$.

a. Set up the integral and determine the volume obtained by revolving *R* about the line, $x = -4$.

b. Set up the integral that calculates the volume of the solid that has base *R* and the cross-sections perpendicular to the $x-$axis are semi-circles. Only set up the integral, do not evaluate it.

c. Set up the integral that calculates the volume of the solid that has base *R* and the cross-sections perpendicular to the $y-$axis are right-angle isosceles triangles with one of the legs on *R*. Only set up the integral, do not evaluate it.