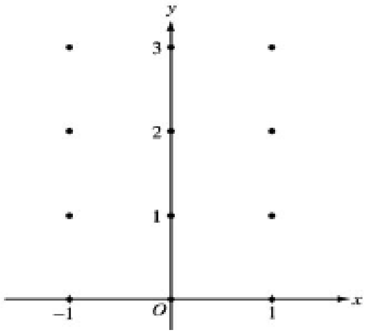
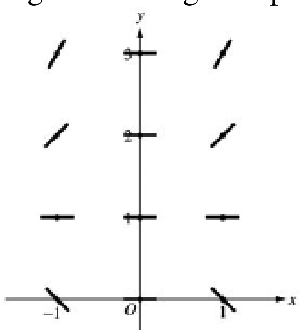
A **Slope Field** (or direction field) consists of line segments with slopes given by the differential equation. These line segments give a visual perspective of the slopes of the solutions of the differential equation.

a. On the axes provided, sketch the slope field for $\frac{dy}{dx} = x^2(y-1)$ at the twelve points indicated.



At each point, evaluate dy/dx, and draw a short segment through that point with the slope equal to the derivative at that point. For instance, at the point (1, 2), $\frac{dy}{dx} = 1^2(2-1) = 1$, therefore we need to draw a segment through the point (1, 2) with a slope of 1.

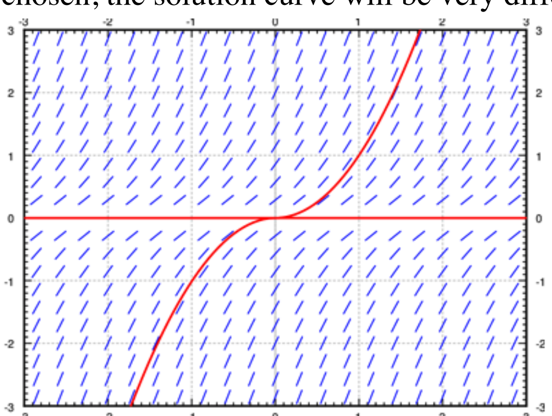


Often you will be given a particular point through which the original function must pass. You will be asked to write that particular solution equation.

$$\frac{dy}{dx} = x^2(y-1) \rightarrow \frac{dy}{y-1} = x^2dx \rightarrow \int \frac{dy}{y-1} = \int x^2dx \rightarrow \ln|y-1| = \frac{1}{3}x^3 + C_1 \rightarrow |y-1| = C_2e^{1/3x^2}$$

$$y-1 = C_3e^{1/3x^2} \rightarrow y = C_3\,e^{1/3x^2} + 1 \rightarrow 3 = C_3\,e^{1/3\cdot 0^2} + 1 \rightarrow C_3 = 2 \rightarrow \boxed{y = 2e^{1/3x^2} + 1}$$

The following shows an approximate solution curve drawn on a slope field through (0, 0). If point (1, -2) is chosen, the solution curve will be very different.



AP Calculus BC 1 Assignment 147 Tuesday, December 15, 2015 Hour Name

Exer 1-5: Find the Particular Solution.

1. $yy' - e^x = 0$; $y(0) = 4$

2. $\sqrt{x} + \sqrt{y}\, y' = 0$; $y(1) = 4$

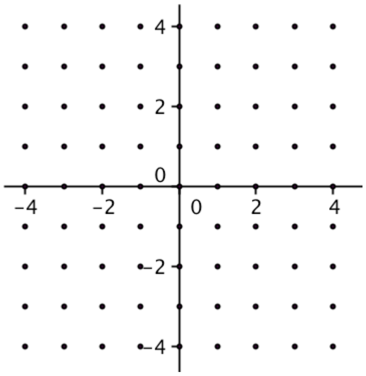
3. $2xy' - \ln x^2 = 0$; $y(1) = 2$

4. $dP - kP\, dt = 0$; $P(0) = P_0$

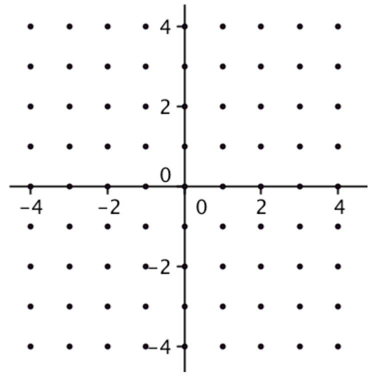
5. $dT + k(T - 70)\, dt = 0$; $T(0) = 140$

6-9. Sketch a few solutions of the differential Equation on each slope field, then find their general solutions below.

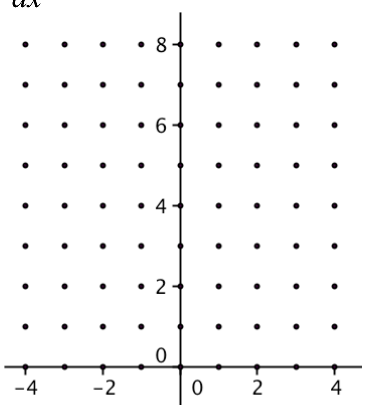
6. $\frac{dy}{dx} = x$



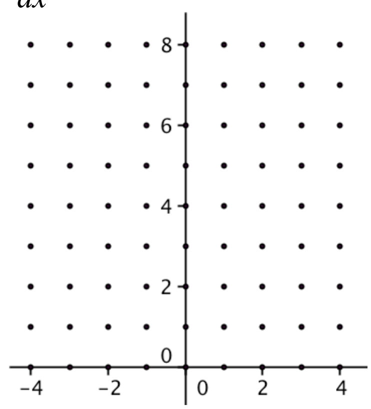
7. $\frac{dy}{dx} = -\frac{x}{y}$



8. $\frac{dy}{dx} = 4 - y$



9. $\frac{dy}{dx} = 0.25x(4 - y)$



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

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

8. $\frac{dy}{dx} = 4 - y$

9. $\frac{dy}{dx} = 0.25x(4 - y)$