

Warm-Up Problems and Lecture Problems

Solutions February 21, 2003

1. Suppose you have a line through the given point, with the given slope. Find the y -value of that line at the given x -value.

(a) Point: $(1, 2)$, Slope: 3. If $x = 0$ then $y =$ _____

Solution: $y = -1$

(b) Point: $(-1, 3)$, Slope: -2 . If $x = 2$ then $y =$ _____

Solution: $y = -3$

(c) Point: $(-2, 3)$, Slope: $\frac{3}{2}$. If $x = -1$ then $y =$ _____

Solution: $y = \frac{9}{2}$

(d) Point: $(0, -5)$, Slope: $-\frac{1}{6}$. If $x = \frac{2}{3}$ then $y =$ _____

Solution: $y = -\frac{46}{9}$

2. Now, come up with a general method to answer question 1 *without* first finding the equation of the line? In other words, find a formula to plug the point, the slope and the x -value into that will give you the y -value. Use your formula to answer the following questions:

(a) Point: $(0, 2)$, Slope: $-\frac{1}{6}$. If $x = 1$ then $y =$ _____

Solution: $y = \frac{11}{6}$

(b) Point: $(1, -5)$, Slope: 0.7. If $x = 1.3$ then $y =$ _____

Solution: $y = -4.79$

(c) Point: $(1.2, 3.5)$, Slope: $-.67$. If $x = 1.3$ then $y =$ _____

Solution: $y = 3.433$

(d) Point: $(1.3, -3.2)$, Slope: 0.23. If $x = 1.42$ then $y =$ _____

Solution: $y = -3.1724$

Solution: We know that the point-slope formula for a line is:

$$y - y_0 = m(x - x_0)$$

Solving for y gives:

$$y = y_0 + m(x - x_0)$$

3. Given the following differential equation:

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

(a) Verify that $y = Ce^{-3x}$ is a solution.

(b) Find the specific solution if $y(1) = 4$ (i.e., find the correct value for C).

Solution: $C = 4e^3$

$$y = 4e^3 e^{-3x}$$

4. Using Euler's method, with step size .2, construct a table of values for the initial value problem:

$$y' = x - y \quad y(0) = 1$$

n	x_n	y_n
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Solution:

n	x_n	y_n
0	0	1
1	0.2	0.8
2	0.4	0.68
3	0.6	0.624
4	0.8	0.6192
5	1.0	0.65536
6	1.2	0.724288
7	1.4	0.8194304
8	1.6	0.93554432
9	1.8	1.068435456
10	2.0	1.2147483648