Day 5 Notes:

$$Slope\ is\ the\ rate\ of\ change: \quad m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

Parallel/Perpendicular Lines:

Parallel Lines: Lines that have the same slope (their rate of change is the same)

Perpendicular Lines: Lines that have slopes which have opposite signs and are reciprocal numbers.

Ex: ½ and -2 or -4 and $\frac{1}{4}$

1. Write the equation of the line passing through (-5, 3) & (-2, 6).

Substitution: $m = \frac{6-3}{-2-5} = \frac{3}{3} = 1$

$y = x + b$

$6 = -2 + b$

$8 = b$

$y = x + 8$

Point Slope Form: **(We will use this more)!**

$y - 6 = 1(x + 2)$ or

$y - 3 = 1(x + 5)$

2. Write the equation through (6, -4) and parallel to line $4x - 3y = -2$.

$m = -\frac{A}{B} = \frac{-4}{-3}$

$y + 4 = 4/3\ (x - 6)$

3. Write the equation passing through (14,-9), perpendicular to $y = \frac{7}{3}x - 2$.

slope $-3/7$

$y + 9 = -3/7\ (x - 14)$

Standard Form is: $y + 9 = -3/7x + 6$

$y = -3/7x - 3$

$7y = -3x - 21$

$3x + 7y = -21$

4. Write the equations that passes through (3, 11) and (-6, 5).

$\frac{11-5}{3-6} = \frac{6}{9} = 2/3$

$y - 11 = 2/3\ (x - 3)$

5. Write the equation that has an x-intercept = -5 and a y – intercept = 7.

$(-5, 0)$ $(0, 7)$ $m = \frac{7}{5}$

$y - 0 = 7/5\ (x + 5)$

6. If the point (3, k) lies on the line with slope m = -2 passing through the point (2, 5), find k.

$y - 5 = -2(x - 2)$

$k - 5 = -2(3 - 2)$

$k = 3$

7. Use slopes to determine whether (8, 0), (-1, -2), (-2, 3) and (7, 5) are vertices of a parallelogram.

$\frac{0--2}{8--1}=\frac{2}{9}$ $\frac{-2-3}{-1--2}=\frac{-5}{1}$ $\frac{3-5}{-2-7}=\frac{-2}{-9}=\frac{2}{9}$ $\frac{5-0}{7-8}=-5$

yes.

8. Determine k so that the points A(7, 3), B(-1, 0), and C(k, -2) are the vertices of a right triangle at B.

$\frac{0-3}{-1-7}=\frac{-3}{-8}=\frac{3}{8}$ $\frac{-2-0}{k+1}=\frac{-8}{3}$ $-8k=2$ $k=-1/4$

$-8k-8=-6$

9. For what values of k will the line $kx - 3y = 4k$ have the following properties: (a) slope of 1; (b) have a y-int of 2; (c) pass through the point (2, 4); (d) be parallel to the line $2x - 4y = 1$; (e) be perpendicular to the line $x - 6y = 2$?

$kx-3y=4k$

$-3y=-kx+4k$

$y=k/3\,x-4/3\,k$

$4=\frac{k}{3}(2)-4/3\,k$

$4=-\frac{2k}{3}$

$m=\frac{-2}{-4}=\frac{1}{2}$ $\frac{k}{3}=\frac{1}{2}$

$m=\frac{-1}{-6}=\frac{1}{6}$ $\frac{k}{3}=\frac{-6}{1}$

a) $k=3$ b) $k=-6/4=-3/2$ c) $k=-6$ d) $k=3/2$ e) $k=-18$

Even and Odd Functions:

Even Function: A function whose graph is symmetric to the y-axis.

$f(-x) = f(x)$

Odd Function: A function whose graph is symmetric to the origin.

$f(-x) = -f(x)$

Ex: $g(x) = x - 2x^5$

$g(-x)=-x-2(-x)^5$

$=-x+2x^5$

odd

Ex: $f(x) = 2|x| + 5$

even

Ex: $h(x) = \frac{3}{x^3 + 2x}$

$h(-x)=\frac{3}{(-x)^3+2(-x)}$

$\frac{3}{-x^3-2x}$ odd

Ex: $h(x) = 5x^{\frac{2}{3}} - 4x$

$5\sqrt[3]{x^2}-4x$

$h(-x)=5\sqrt[3]{(-x)^2}-4(-x)$

$=5\sqrt[3]{x^2}+4x$

neither

Systems of Equations:

Ex: $2x + 4y = 8$

$3x + 6y = 18$

$6x+12y=24$

$-6x-12y=-36$

no solution

Ex: $x + 2y = 11$

$x - 2y = -1$

$2x=10$

$x=5$

$y=3$

Ex: $x^2 + 4y^2 = 36$

$x^2 = -y + 3$

$-y+3+4y^2=36$

$4y^2-y-33=0$

$(4y+11)(y-3)$

$y=-11/4$ $y=3$

$x^2=11/4+3$ $x^2=-3+3$

$x=\pm\frac{\sqrt{23}}{2}$ $(0,3)$

$(\sqrt{23}/2,-11/4)(-\sqrt{23}/2,-11/4)$

Ex: $x^2 + 4y^2 = 4$

$4x^2 + 9y^2 = 36$

$-4x^2-16y^2=-16$

$-7y^2=20$

$y^2=-20/7$

no solution.

Solve for y in terms of x:

Ex: $\frac{1}{3y^2} = x^2 + 2$

$3y^2(x^2+2)=1$

$y^2=\frac{1}{3(x^2+2)}$

$y=\pm\sqrt{\frac{1}{3(x^2+2)}}$

Ex: $3xy - 2x^2 = 5y + x - 7$

$3xy-5y=2x^2+x-7$

$y(3x-5)=2x^2+x-7$

$y=\frac{2x^2+x-7}{3x-5}$

Ex: $2\log_3(y-1) = 3x + 1$

$\log_3(y-1)^2=3x+1$

$(y-1)^2=3^{3x+1}$

$y=\pm\sqrt{3^{3x+1}}+1$