Linear Functions

A. Determine the indicated characteristics:

1. slope and y-intercept of the equation: y = (2/3)x - 6

m = 2/3, y-intercept = b = -6

2. The slope and y-intercept of the equation 5x - 2y = 7

$$-2y = -5x + 7$$

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

m = 5/2, b = -7/2

3. slope of the line segment joining the points (-5, 1) and (-12, 9)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-9}{(-5)-(-12)} = \frac{-8}{-5+12} = \frac{-8}{7}$$

B. Determine the equation of the following linear functions given the indicated information:

1. slope is 2/3 and the y-intercept is 7

$$y = mx + b$$
$$y = \frac{2}{3}x + 7$$
$$3 * y = 3 * \frac{2}{3}x + 3 * 7$$
$$3y = 2x + 21$$
$$-2x + 3y = 21$$

2. m = -5/3 and b = -2

$$y = mx + b$$
$$y = -\frac{5}{3}x - 2$$
$$3 * y = 3 * -\frac{5}{3}x - 3 * 2$$
$$3y = -5x - 6$$
$$5x - 3y = -6$$

3. slope is 4/7 and contains the point (-1, 4)

$$(y_2 - y_1) = m(x_2 - x_1)$$
$$(y - 4) = \frac{4}{7}(x - (-1))$$
$$7 * (y - 4) = 7 * \frac{4}{7}(x + 1)$$
$$7y - 28 = 4x + 4$$
$$7y = 4x + 32$$
$$-4x + 7y = 32$$

4. m = -7/2 and the point is (-4, -3)

$$(y_2 - y_1) = m(x_2 - x_1)$$
$$(y - (-3)) = \frac{-7}{2}(x - (-4))$$
$$2 * (y + 3) = 2 * \frac{-7}{2}(x + 4)$$
$$2y + 6 = -7x - 28$$
$$2y = -7x - 34$$
$$7x + 2y = -34$$

5. passing through the points (5, 4) and (-3, 10)

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{4-10}{5-(-3)}=\frac{-6}{5+3}=\frac{-6}{8}=\frac{-3}{4}$$

$$(y_2-y_1)=m(x_2-x_1)$$
$$(y-4)=\frac{-3}{4}(x-5)$$
$$4*(y-4)=4*\frac{-3}{4}(x-5)$$
$$4y-16=-3x+15$$
$$4y=-3x+31$$

6. Passing through the points (11,-2) and (4, 4)

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{-2-4}{11-4}=\frac{-6}{7}=\frac{-6}{7}$$

$$(y_2-y_1)=m(x_2-x_1)$$
$$(y-(-2))=\frac{-6}{7}(x-11)$$
$$7*(y+2)=7*\frac{-6}{7}(x-11)$$
$$7y+14=-6x+66$$
$$7y=-6x+52$$

7. passing through (-7, 1) and parallel to the equation –5x + 4y = 11

$$4y=5x+11$$
$$y=\frac{5}{4}x+\frac{11}{4},\ m_1=\frac{5}{4}$$

$$m_2=\frac{5}{4},\ (-7,1)$$
$$(y_2-y_1)=m(x_2-x_1)$$
$$(y-1)=\frac{5}{4}(x-(-7))$$
$$4*(y-1)=4*\frac{5}{4}(x+7)$$
$$4y-4=5x+35$$
$$4y=5x+39$$

8. passing through (-5, -3) and perpendicular to the line segment passing through (-9, -5) and (-13, 3).

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{5-3}{-9-(-13)}=\frac{2}{-9+13}=\frac{2}{4}=\frac{1}{2}$$
$$m_1=\frac{1}{2},\ \ \therefore\ m_2=-2$$

$$m_2=-2,\ \ (-5,-3)$$
$$(y_2-y_1)=m(x_2-x_1)$$
$$(y-(-3))=-2(x-(-5))$$
$$(y+3)=-2(x+5)$$
$$y+3=-2x-10$$
$$y=-2x-13$$

9. equation of the perpendicular bisector of the line segment defined by the points (-6, 11) and (12, -7)

$$m=\frac{y_2-y_1}{x_2-x_1}$$
$$m=\frac{11-(-7)}{-6-12}$$
$$m=\frac{11+7}{-18}$$
$$m=\frac{18}{-18}=-1$$
$$m_1=-1,\ \ m_2=1$$

$$M\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)=$$
$$M\left(\frac{-6+12}{2},\frac{11+(-7)}{2}\right)=$$
$$M\left(\frac{6}{2},\frac{4}{2}\right)=$$
$$M(3,2)$$

$$m_2=1,\ (3,2)$$
$$(y_2-y_1)=m(x_2-x_1)$$
$$(y-2)=1(x-3)$$
$$y-2=x-3$$
$$y=x-1$$