P.2 Linear Models & Rates of change

Slope $m = \frac{\Delta y}{\Delta x} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$, $x_1 \neq x_2$

Point-Slope Equation of a Line: $y - y_1 = m(x - x_1)$

Slope-Intercept Equation of a Line: $y = mx + b$

#32 Find an equation of a the line that passes through the point $(-2, 4)$ and has the slope $m = -3/5$.

$$y - y_1 = m(x - x_1)$$
$$y - (4) = \left(\frac{-3}{5}\right)[x - (-2)]$$
$$y - 4 = -\frac{3}{5}(x + 2)$$
$$y - 4 = -\frac{3}{5}x - \frac{6}{5}$$
$$4 + y - 4 = -\frac{3}{5}x - \frac{6}{5} + \frac{20}{5}$$
$$\boxed{y = -\frac{3}{5}x + \frac{14}{5}}$$

#62 Write an equation of the line through the point
(a) parallel to $3x+4y=7$, through $(-6,4)$
& (b) perpendicular to $3x+4y=7$, through $(-6,4)$

Find slope of $3x+4y=7$ $\longrightarrow$ $y=mx+b$

$$-3x+3x+4y=-3x+7$$
$$\tfrac{1}{4}\cdot 4y=(-3x+7)\cdot\tfrac{1}{4}$$
$$y=-\tfrac{3}{4}x+\tfrac{7}{4}$$

$$m=-\tfrac{3}{4}$$

(a) A parallel line to $3x+4y=7$, through $(-6,4)$ has the same slope.

$$y-y_1=m(x-x_1)$$
$$y-(4)=(-3/4)[x-(-6)]$$
$$y-4=-\tfrac{3}{4}(x+6)$$
$$y-4=-\tfrac{3}{4}x-\tfrac{18}{4}$$
$$4+y-4=-\tfrac{3}{4}x-\tfrac{9}{2}+\tfrac{8}{2}$$
$$\boxed{y=-\tfrac{3}{4}x-\tfrac{1}{2}}$$

(b) A perpendicular line to $3x+4y=7$, through $(-6,4)$ has a negative reciprocal slope: (ie) $m=+\tfrac{4}{3}$

$$y-(4)=(\tfrac{4}{3})[x-(-6)]$$
$$y-4=\tfrac{4}{3}(x+6)$$
$$y-4=\tfrac{4}{3}x+\tfrac{24}{3}$$
$$4+y-4=\tfrac{4}{3}x+8+4$$
$$\boxed{y=\tfrac{4}{3}x+12}$$