A & M, Chapter 3

9. \( y = 3x + 2 \) (slope = 3)
   \( y = 3x - 2 \) (slope = 3)

The two lines have the same slope, hence they are parallel.

6. \( y = 2x - 4 \) (slope = 2)
   \( y = 3x + 5 \) (slope = 3)

The slopes of the two lines are neither equal nor negative reciprocals of each other, hence the two lines are neither parallel nor perpendicular.

C. \( 3x - 2y = 5 \) \( \Rightarrow \) \(-2y = -3x + 5 \) \( \Rightarrow \) \( y = \frac{3}{2}x - \frac{5}{2} \) (slope = \( \frac{3}{2} \))
   \( 2x + 3y = 4 \) \( \Rightarrow \) \( 3y = -2x + 4 \) \( \Rightarrow \) \( y = -\frac{2}{3}x + \frac{4}{3} \) (slope = \(-\frac{2}{3}\))

The slopes of the two lines are negative reciprocals of each other, hence the lines are perpendicular.

A & M, Chapter 4

2. (a) \( x^2 + y^2 + 16x - 12y + 10 = 0 \)
   \( \Rightarrow \) \( (x^2 + 16x + 64) + (y^2 - 12y + 36) = -10 + 64 + 36 \)
   \( \Rightarrow \) \( (x + 8)^2 + (y - 6)^2 = 90 \)

radius = \( \sqrt{90} = \sqrt{9 \cdot 10} = 3\sqrt{10} \)

Circle of radius \( 3\sqrt{10} \) centered at \((-8, 6)\)

4. \( x^2 + y^2 + 3\sqrt{2}x - 2 = 0 \)
   \( \Rightarrow \) \( (x^2 + \sqrt{2}x + \frac{1}{2}) + (y^2) = \frac{2 + 1}{2} \)
   \( \Rightarrow \) \( (x + \sqrt{\frac{1}{2}})^2 + (y - 0)^2 = \frac{3}{2} \)

There appears to be a typo in the book. The term should be \( \sqrt{2} \cdot x \), not \( \sqrt{2}x \)

radius = \( \sqrt{\frac{3}{2}} = \sqrt{\frac{3}{2}} \cdot \sqrt{2} = \sqrt{3} \)

Circle of radius \( \sqrt{3} \) centered at \((-\frac{1}{2}\sqrt{2}, 0)\).
C is the center of the circle defined by 
\((x-1)^2 + (y-3)^2 = 1\), thus C is the point \((1,3)\). T is the point of tangency, thus \(CT \perp TP\). By the Pythagorean Theorem, 
\((CT)^2 + (TP)^2 = (CP)^2\).

Hence
\[TP = \sqrt{(CP)^2 - (CT)^2} \]

As T is on the circle of radius 1 centered at C, CT = 1. By the distance formula,
\[
CP = \sqrt{(1-6)^2 + (3+2)^2} = \sqrt{(-5)^2 + (5)^2} = \sqrt{50}
\]

Therefore
\[
TP = \sqrt{(\sqrt{50})^2 - (1)^2} = \sqrt{50 - 1} = \sqrt{49} = 7
\]

Thus, the length of a segment tangent to the circle C through the point \(P = (6,-2)\) is \(7\).

\[\text{A & M, Chapter 5}\]

(2)(a)
Graph of \(y = x^3 - 1\) shifted down by 1 unit.

(6)
Graph of \(y = (x-2)^3\) shifted right by 2 units.
Graph of \( y = (x+1)^2 - 2 \) shifted down by 2 units and right by 1 unit.

\( x^2 - y = -1 \) is a hyperbola with asymptotes on the \( x \)- and \( y \)-axes and vertices at \((-1, 1)\) and \((1, -1)\).

**A & M, Chapter 6**

1. \( A(x) = |x-3| \)

   - Domain of \( f = \mathbb{R} \)
   - Range of \( f = [0, \infty) \)

2. \( A(x) = \frac{|x|}{x} \)

   - Domain of \( f = \mathbb{R} \setminus \{0\} \)
   - Range of \( f = \{-1, 1\} \)
\[
\begin{align*}
\text{(a)} & \quad y = \frac{1}{x+1} - 2 \\
\text{(b)} & \quad y = \frac{4x - 2}{x - 2}
\end{align*}
\]