A & M, Chapter 3

(19) (a)

$$y = 3x + 2 \qquad (\text{slope} = 3)$$
$$y = 3x - 2 \qquad (\text{slope} = 3)$$

The two lines have the same slope, hence they are $\boxed{\text{parallel.}}$

(b)

$$y = 2x - 4 \qquad (\text{slope} = 2)$$
$$y = 3x + 5 \qquad (\text{Slope} = 3)$$

The slopes of the two lines are neither equal nor negative reciprocals of each other, hence the two lines are $\boxed{\text{neither}}$ parallel nor perpendicular.

(c)

$$3x - 2y = 5 \Rightarrow -2y = -3x + 5 \Rightarrow y = \tfrac{3}{2}x + \tfrac{5}{2} \qquad (\text{slope} = \tfrac{3}{2})$$
$$2x + 3y = 4 \Rightarrow 3y = -2x + 4 \Rightarrow y = -\tfrac{2}{3}x + 2 \qquad (\text{slope} = -\tfrac{2}{3})$$

The slopes of the two lines are negative reciprocals of each other, hence the lines are $\boxed{\text{perpendicular.}}$

A & M, Chapter 4

(7) (a)

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

$$\text{radius} = \sqrt{90} = \sqrt{9 \cdot 10} = 3\sqrt{10}$$

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

(f)

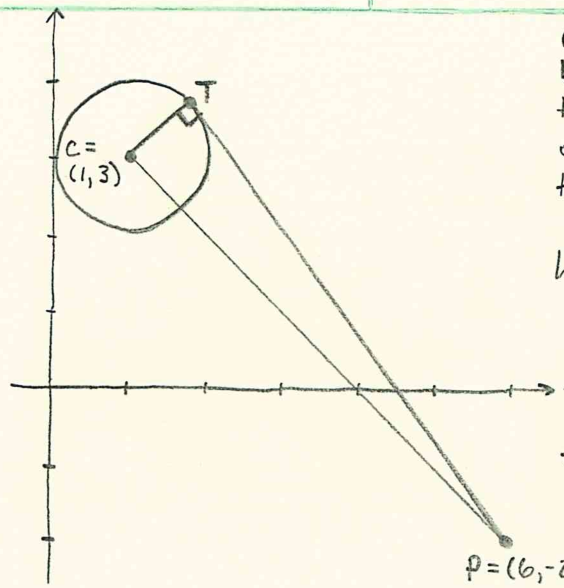
$$x^2 + y^2 + \sqrt{2}x - 2 = 0 \Rightarrow (x^2 + \sqrt{2}x + \tfrac{1}{2}) + (y^2) = 2 + \tfrac{1}{2}$$
$$\Rightarrow (x + \tfrac{\sqrt{2}}{2})^2 + (y + 0)^2 = \tfrac{5}{2}$$

there appears to by a typo in the book – this term should be $\sqrt{2} \cdot x$, not $\sqrt{2x}$

$$\text{radius} = \sqrt{\tfrac{5}{2}} = \tfrac{\sqrt{5}}{\sqrt{2}} \cdot \tfrac{\sqrt{2}}{\sqrt{2}} = \sqrt{10}/2$$

$$\boxed{\text{Circle of radius } \tfrac{1}{2}\sqrt{10} \text{ centered at } (-\tfrac{1}{2}\sqrt{2}, 0).}$$

(18)



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 $\overline{CT} \perp \overline{TP}$. 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,

$$\begin{aligned} CP &= \sqrt{(1-6)^2 + (3+2)^2} \\ &= \sqrt{(-5)^2 + (5)^2} \\ &= \sqrt{50} \end{aligned}$$

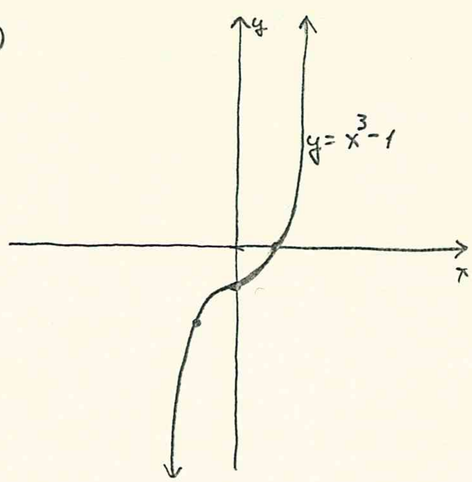
Therefore

$$\begin{aligned} TP &= \sqrt{(\sqrt{50})^2 - (1)^2} \\ &= \sqrt{50 - 1} \\ &= \sqrt{49} \\ &= 7 \end{aligned}$$

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

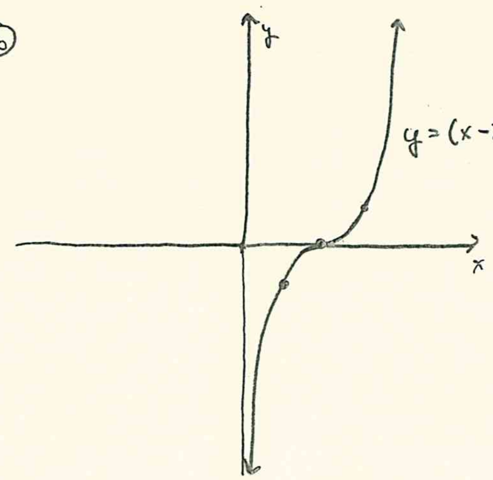
A & M, Chapter 5

(21) (a)



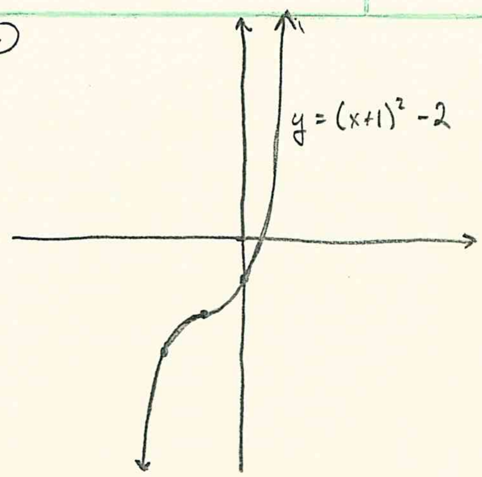
Graph of x^3 shifted down by 1 unit.

(b)



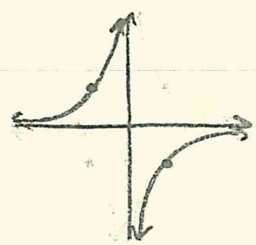
Graph of x^3 shifted right by 2 units.

(c)



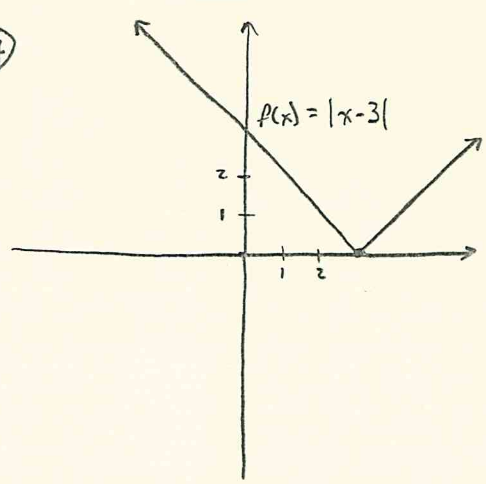
Graph of x^3 shifted down by 2 units and right by 1 unit.

(23) (i) $xy = -1$ is a hyperbola with asymptotes on the x- and y-axes and vertices at $(-1, 1)$ and $(1, -1)$



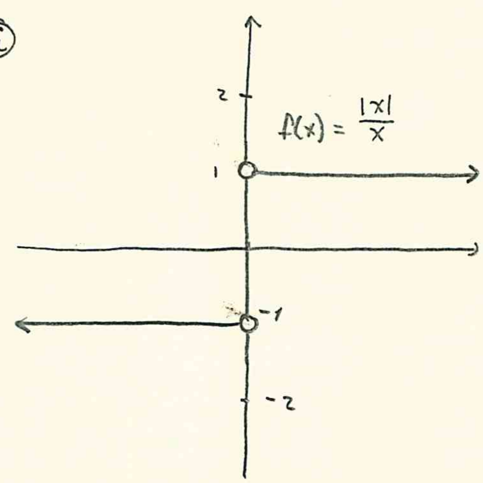
A & M, Chapter 6

(18) (g)



domain of $f = \mathbb{R}$
range of $f = [0, \infty)$

(i)



domain of $f = \mathbb{R} \setminus \{0\}$
range of $f = \{-1, 1\}$

Lang, § 2.8

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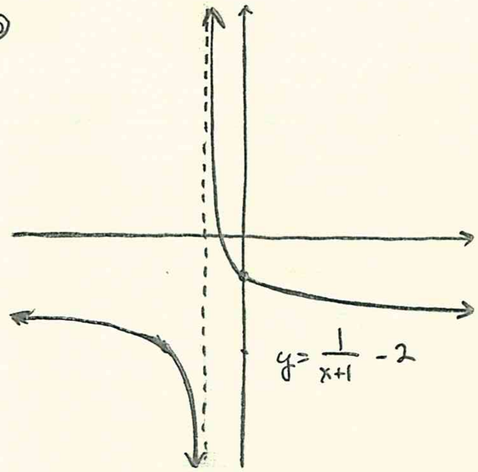

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