30. (1) Since $AB < BC < AC$,

$m\angle C < m\angle A < m\angle B.$

$m\angle C + m\angle A + m\angle B = 180°$

$m\angle C + m\angle C + m\angle C < 180°$

$3m\angle C < 180°$

$m\angle C < 60°$

Therefore the answer is **B.**

Problem Set 41

1. (39) $50°\left(\frac{\pi}{180°}\right)35 = \frac{175\pi}{18} = \mathbf{30.54\ ft}$

2. (38) Overall average rate $= \frac{\text{overall distance}}{\text{overall time}}$

$$15 \text{ mph} = \frac{36 \text{ miles} + 45 \text{ miles} + 54 \text{ miles}}{\text{overall time}}$$

$$15 \text{ mph} = \frac{135 \text{ miles}}{\text{overall time}}$$

Overall time = 9 hours

$$T_1 = \frac{D_1}{R_1} = \frac{36 \text{ mi}}{12 \text{ mph}} = 3 \text{ hr}$$

$$T_2 = \frac{D_2}{R_2} = \frac{45 \text{ mi}}{15 \text{ mph}} = 3 \text{ hr}$$

T_3 = overall time $- T_1 - T_2$

$= 9 \text{ hr} - 3 \text{ hr} - 3 \text{ hr} = 3 \text{ hr}$

$$R_3 = \frac{D_3}{T_3} = \frac{54 \text{ mi}}{3 \text{ hr}} = \mathbf{18 \text{ mph}}$$

3. (25) RWT = jobs

$R(400)(10) = 1$

$$R = \frac{1}{4000}\frac{\text{job}}{\text{men-days}}$$

RWT = jobs

$$\frac{1}{4000}[(600)(5) + (x)5] = 1 \text{ job}$$

$3000 + 5x = 4000$

$$x = \frac{1000}{5} = \mathbf{200 \text{ men}}$$

4. (25) $R_BT_B + R_DT_D$ = jobs

$$\frac{1}{3}(3 + T) + \frac{1}{6}T = 4$$

$$1 + \frac{1}{3}T + \frac{1}{6}T = 4$$

$$\frac{1}{2}T = 3$$

$T = 6$ hr

Time = noon + 3 hours + 6 hours

Time = **9:00 P.M.**

5. (28) New rate $= \frac{\text{distance}}{\text{new time}} = \frac{m}{h - 3}\frac{\text{mi}}{\text{hr}}$

6. (41) $\csc(-330°) - \sec 390°$

$= \csc 30° - \sec 30°$

$$= \frac{1}{\sin 30°} - \frac{1}{\cos 30°}$$

$$= \frac{1}{\frac{1}{2}} - \frac{1}{\frac{\sqrt{3}}{2}}$$

$$= 2 - \frac{2}{\sqrt{3}} = \frac{\mathbf{6 - 2\sqrt{3}}}{\mathbf{3}}$$

7. (41) $\sec\left(-\frac{\pi}{3}\right) + \cot\left(-\frac{13\pi}{6}\right)$

$$= \sec\left(\frac{\pi}{3}\right) + \cot\left(-\frac{\pi}{6}\right)$$

$$= \frac{1}{\cos\frac{\pi}{3}} + \frac{1}{\left(-\tan\frac{\pi}{6}\right)}$$

$$= \frac{1}{\cos 60°} - \frac{1}{\tan 30°}$$

$$= \frac{1}{\frac{1}{2}} - \frac{1}{\frac{1}{\sqrt{3}}} = \mathbf{2 - \sqrt{3}}$$

8. (41) (a) ${}_nP_r = \frac{n!}{(n - r)!}$

$${}_{10}P_4 = \frac{10!}{(10 - 4)!} = \frac{10!}{6!} = \mathbf{5040}$$

(b) ${}_nP_r = \frac{n!}{(n - r)!}$

$${}_{13}P_5 = \frac{13!}{(13 - 5)!} = \frac{13!}{8!} = \mathbf{154{,}440}$$

9. *(40)*
$$\log_4 2 + \log_4 8 = \log_4 (x + 3)$$
$$\log_4 (2 \cdot 8) = \log_4 (x + 3)$$
$$16 = x + 3$$
$$x = \mathbf{13}$$

10. *(40)*
$$\log_3 (x - 2) - \log_3 (x + 1) = \log_3 5$$
$$\log_3 \left(\frac{x - 2}{x + 1}\right) = \log_3 5$$
$$\frac{(x - 2)}{(x + 1)} = 5$$
$$x - 2 = 5x + 5$$
$$x = -\frac{7}{4}$$

No solution. You cannot take the log of a negative number.

11. *(40)*
$$4 \log_c x = \log_c 81$$
$$\log_c x^4 = \log_c 81$$
$$x^4 = 81$$
$$x = \mathbf{3}$$

12. *(40)*
$$\log_{13} x = \frac{3}{4} \log_{13} 16$$
$$\log_{13} x = \log_{13} 16^{\frac{3}{4}}$$
$$x = 16^{\frac{3}{4}} = \mathbf{8}$$

13. *(40)*
$$(f \circ g)(x) = 4\left(\frac{1}{4}x + 3\right) - 3$$
$$= x + 12 - 3 = x + 9$$
$$(g \circ f)(x) = \frac{1}{4}(4x - 3) + 3$$
$$= x - \frac{3}{4} + 3 = x + 2\frac{1}{4}$$
$$(f \circ g)(x) \neq x$$
$$(g \circ f)(x) \neq x$$

No, f and g are not inverse functions.

14. *(39)*
$$y - y_1 = m(x - x_1)$$
$$y - 3 = -\frac{1}{3}(x + 2)$$
$$-3y + 9 = x + 2$$
$$x + 3y - 7 = \mathbf{0}$$

15. *(39)*
$$5x - 3y = -6$$
$$\frac{5x}{-6} - \frac{3y}{-6} = \frac{-6}{-6}$$
$$\frac{5x}{-6} + \frac{y}{2} = 1$$
$$\frac{x}{-\frac{6}{5}} + \frac{y}{2} = \mathbf{1}$$

16. *(38)*
$$\left(x + \frac{1}{2}\right)\left(x - \frac{2}{3}\right) = 0$$
$$x^2 - \frac{2}{3}x + \frac{1}{2}x - \frac{2}{6} = 0$$
$$x^2 - \frac{1}{6}x - \frac{1}{3} = \mathbf{0}$$

17. *(37,39)*
$$\sqrt{(x - 2)^2 + (y - 4)^2} = \sqrt{(x + 4)^2 + (y - 6)^2}$$
$$x^2 - 4x + 4 + y^2 - 8y + 16$$
$$= x^2 + 8x + 16 + y^2 - 12y + 36$$
$$-12x + 4y = 32$$
$$-\frac{12x}{32} + \frac{4y}{32} = \frac{32}{32}$$
$$-\frac{3x}{8} + \frac{y}{8} = 1$$
$$\frac{x}{-\frac{8}{3}} + \frac{y}{8} = \mathbf{1}$$

18. *(35)*
$$-\frac{15}{4} + \frac{4}{13}\left(6 + \frac{15}{4}\right) = -\frac{15}{4} + \frac{4}{13}\left(\frac{39}{4}\right)$$
$$= -\frac{15}{4} + 3 = -\frac{\mathbf{3}}{\mathbf{4}}$$

19. *(34)*
$$\sum_{z=-2}^{1}\left(\frac{z^3 - 1}{3}\right)$$
$$= \left(\frac{(-2)^3 - 1}{3}\right) + \left(\frac{(-1)^3 - 1}{3}\right) + \left(\frac{(0)^3 - 1}{3}\right) + \left(\frac{(1)^3 - 1}{3}\right)$$
$$= \left(\frac{-8 - 1}{3}\right) + \left(\frac{-1 - 1}{3}\right) + \left(\frac{-1}{3}\right) + \left(\frac{0}{3}\right)$$
$$= -3 - \frac{2}{3} - \frac{1}{3} = -4$$

20. (34) From the graph of the line we choose two ordered pairs: (0, 0) and (10, 10).

$$m = \frac{10 - 0}{10 - 0} = 1$$

$$H = 1S + b$$

$$0 = 1(0) + b$$

$$b = 0$$

$$\mathbf{H = S}$$

21. (33) Since the diagonal bisects the angles of two opposite vertices, all sides must be congruent. Therefore, the answer is **C**.

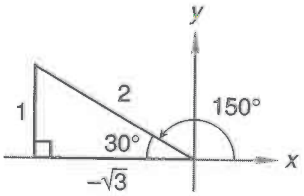
22. (33)

$$A_{\text{trapezoid}} = \frac{1}{2}(H)(B_1 + B_2)$$

$$60 = \frac{1}{2}(H)(8 + 12)$$

$$H = \mathbf{6\ cm}$$

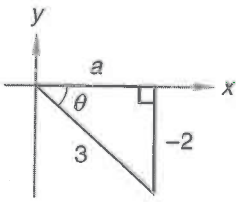
23. (32) (a)



$$0° \le \theta \le 180°$$

$$\text{Arccos}\left(-\frac{\sqrt{3}}{2}\right) = \mathbf{150°}$$

(b)



$$-90° \le \theta \le 90°$$

$$a = \sqrt{3^2 - (-2)^2} = \sqrt{5}$$

$$\cos\left[\text{Arcsin}\left(-\frac{2}{3}\right)\right] = \cos\theta = \frac{\sqrt{5}}{3}$$

24. (31) Replace x with $x + 3$.

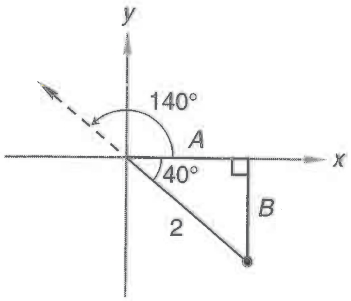
$$y = \frac{1}{x + 3}$$

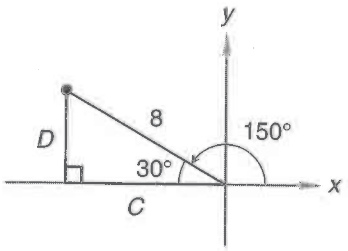
25. (31) Replace y with $y - 2$ and x with $x - 3$.

$$y - 2 = |x - 3|$$

$$y = |x - 3| + 2$$

26. (30) $-2\angle 140° + 8\angle 150°$





$$A = 2\cos 40° = 1.5321$$

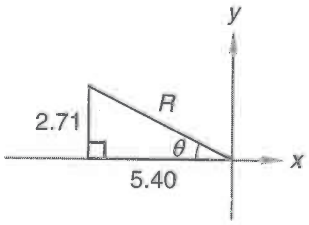
$$B = 2\sin 40° = 1.2856$$

$$C = 8\cos 30° = 6.9282$$

$$D = 8\sin 30° = 4$$

$$\text{Resultant} = (1.5321 - 6.9282)\hat{i} + (-1.2856 + 4)\hat{j}$$

$$= -5.3961\hat{i} + 2.7144\hat{j}$$



$$R = \sqrt{(5.3961)^2 + (2.7144)^2} = 6.04$$

$$\tan\theta = \frac{2.7144}{5.3961}$$

$$\theta = 26.70°$$

Since θ is in the second quadrant, the polar angle is $180° - 26.70° = 153.30°$.

$$\mathbf{6.04\angle 153.30°}$$

27. (21) (a) **Domain** $= \{x \in \mathbb{R} \mid -6 \le x \le 5\}$

Range $= \{y \in \mathbb{R} \mid -3 \le y \le 4\}$

(b) **Domain** $= \{x \in \mathbb{R} \mid -4 \le x \le 4\}$

Range $= \{y \in \mathbb{R} \mid -2 \le y \le 6\}$

28. (21)

$$\frac{f(x+h)-f(x)}{h} = \frac{\frac{1}{x+h}-\frac{1}{x}}{h}$$

$$= \frac{\frac{x-(x+h)}{x(x+h)}}{h} = \frac{-h}{xh(x+h)} = \frac{-1}{x(x+h)}$$

29. (1,40)

A: $\log_2 6 + \log_2 5 = \log_2 30$

B: $\log_2 3 + \log_2 10 = \log_2 30$

A and B are equal. Therefore the answer is **C.**

30. (1)

$$AC = BC$$

$$3x + 16 = 2x + 22$$

$$x = 6$$

$6 > 5$

$x > 5$

Therefore the answer is **A.**

Problem Set 42

1. (39)

$$40°\left(\frac{\pi}{180°}\right)1500 = \frac{3000\pi}{9} = \mathbf{1047.20\ ft}$$

2. (36)

First, we write the equations.

(a) $(B + C)T_D = D_D$

(b) $(B - C)T_U = D_U$

$D_D = D_U = 75$

$T_D = 3,\ T_U = 5$

Next, we use substitution to solve.

$$D_D = D_U$$

$$(B + C)T_D = (B - C)T_U$$

$$(B + C)3 = (B - C)5$$

$$3B + 3C = 5B - 5C$$

$$2B = 8C$$

$$B = 4C$$

(a) $(B + C)T_D = D_D$

$(B + C)3 = 75$

$(4C + C)3 = 75$

$15C = 75$

$C = \mathbf{5\ mph}$

$B = 4C$

$B = 4(5)$

$B = \mathbf{20\ mph}$

3. (25)

$$\frac{\left(\frac{440}{49}\right)}{\left(\frac{100}{9.8}\right)} = \frac{9.8(440)}{49(100)} = \mathbf{0.88}$$

4. (25)

$$R_eT_e + R_aT_a = \text{jobs}$$

$$\left(\frac{1}{12}\right)(5) + R_a(5) = 1\frac{1}{24}$$

$$5R_a = \frac{15}{24}$$

$$R_a = \frac{1}{8}$$

$$R_aT_a = \text{jobs}$$

$$\left(\frac{1}{8}\right)T = 2$$

$$T = \mathbf{16\ hr}$$

5. (25)

$$RWT = \text{jobs}$$

$$R(5)(3) = 7$$

$$R = \frac{7}{15}\ \frac{\text{jobs}}{\text{worker-day}}$$

$$RWT = \text{jobs}$$

$$\left(\frac{7}{15}\right)(10)T = 14$$

$$T = \mathbf{3\ days}$$

6. (25)

$$\text{Rate} = \frac{\$160}{40\ \text{hr}} = 4\ \frac{\text{dollars}}{\text{hr}}$$

$$\text{New rate} = 1.25 \times \text{rate} = 1.25(4) = 5\ \frac{\text{dollars}}{\text{hr}}$$

$$\text{New rate} \times T = \text{dollars}$$

$$5(60) = \mathbf{\$300}$$

7. (42)

$$\sqrt{(x-h)^2 + (y-k)^2} = r$$

$$\sqrt{(x-3)^2 + (y-4)^2} = 3$$

$$\mathbf{(x-3)^2 + (y-4)^2 = 3^2}$$

8. (42)

$$y = \left(\frac{1}{2}\right)^{2x} = \left(\frac{1}{4}\right)^x$$