62. To show that $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ is the midpoint of the line segment joining (x_1, y_1) and (x_2, y_2) we must show that $d_1 = d_2$ and $d_1 + d_2 = d_3$ (see graph).

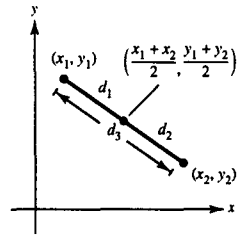
$$d_1 = \sqrt{\left(\frac{x_1 + x_2}{2} - x_1\right)^2 + \left(\frac{y_1 + y_2}{2} - y_1\right)^2}$$

$$= \sqrt{\left(\frac{x_2 - x_1}{2}\right)^2 + \left(\frac{y_2 - y_1}{2}\right)^2} = \frac{1}{2}\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d_2 = \sqrt{\left(x_2 - \frac{x_1 + x_2}{2}\right)^2 + \left(y_2 - \frac{y_1 - y_2}{2}\right)^2}$$

$$= \sqrt{\left(\frac{x_2 - x_1}{2}\right)^2 + \left(\frac{y_2 - y_1}{2}\right)^2} = \frac{1}{2}\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d_3 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



Therefore, $d_1 = d_2$ and $d_1 + d_2 = d_3$.

Appendix A.3

1. (a) $396°, -324°$

(b) $240°, -480°$

2. (a) $660°, -60°$

(b) $300°, -60°$

3. (a) $\frac{19\pi}{9}, -\frac{17\pi}{9}$

(b) $\frac{10\pi}{3}, -\frac{2\pi}{3}$

4. (a) $\frac{7\pi}{4}, -\frac{\pi}{4}$

(b) $\frac{26\pi}{9}, -\frac{10\pi}{9}$

5. (a) $30\left(\frac{\pi}{180}\right) = \frac{\pi}{6} \approx 0.524$

(b) $150\left(\frac{\pi}{180}\right) = \frac{5\pi}{6} \approx 2.618$

(c) $315\left(\frac{\pi}{180}\right) = \frac{7\pi}{4} \approx 5.498$

(d) $120\left(\frac{\pi}{180}\right) = \frac{2\pi}{3} \approx 2.094$

6. (a) $-20\left(\frac{\pi}{180}\right) = -\frac{\pi}{9} \approx -0.349$

(b) $-240\left(\frac{\pi}{180}\right) = -\frac{4\pi}{3} \approx -4.189$

(c) $-270\left(\frac{\pi}{180}\right) = -\frac{3\pi}{2} \approx -4.712$

(d) $144\left(\frac{\pi}{180}\right) = \frac{4\pi}{5} \approx 2.513$

7. (a) $\frac{3\pi}{2}\left(\frac{180}{\pi}\right) = 270°$

(b) $\frac{7\pi}{6}\left(\frac{180}{\pi}\right) = 210°$

(c) $-\frac{7\pi}{12}\left(\frac{180}{\pi}\right) = -105°$

(d) $-2.637\left(\frac{180}{\pi}\right) \approx -135.6°$

8. (a) $\frac{7\pi}{3}\left(\frac{180}{\pi}\right) = 420°$

(b) $-\frac{11}{30}\left(\frac{180}{\pi}\right) = -66°$

(c) $\frac{11\pi}{6}\left(\frac{180}{\pi}\right) = 330°$

(d) $0.438\left(\frac{180}{\pi}\right) \approx 25.1°$

9.

r	8 ft	15 in.	85 cm	24 in.	$\frac{12963}{\pi}$ mi.
s	12 ft.	24 in.	63.72π	96 in.	8642 mi.
θ	1.5	1.6	$\frac{3\pi}{4}$	4	$\frac{2\pi}{3}$

10. (a) $50 \text{ mph} = \frac{50(5280)}{60} = 4400 \text{ ft/min}$

Circumference of tire: $C = 2.5\pi$ feet

Revolutions per minute: $\frac{4400}{2.5\pi} \approx 560.2$

(b) $\theta = \frac{4400}{2.5\pi}(2\pi) = 3520$ radians

Angular speed: $\frac{\theta}{t} = \frac{3520 \text{ radians}}{1 \text{ minute}} = 3520 \text{ rad/min}$