

86. Area = arctan b - arctan a

(a) $a = 0, b = 1$

Area = arctan 1 - arctan 0 = $\frac{\pi}{4} - 0 = \frac{\pi}{4} \approx 0.785$

(c) $a = 0, b = 3$

Area = arctan 3 - arctan 0
 $\approx 1.25 - 0 = 1.25$
 $= 1.25$

(b) $a = -1, b = 1$

Area = arctan 1 - arctan(-1)
 $= \frac{\pi}{4} - \left(-\frac{\pi}{4}\right) = \frac{\pi}{2} \approx 1.571$

(d) $a = -1, b = 3$

Area = arctan 3 - arctan(-1)
 $\approx 1.25 - \left(-\frac{\pi}{4}\right) \approx 2.03$

88. $\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{\sqrt{3}\sqrt{3}} = \frac{2\sqrt{3}}{3}$

92. $\tan \theta = 2, 0 < \theta < \frac{\pi}{2}$

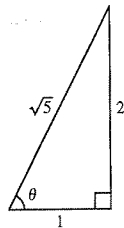
$\sin \theta = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$

$\cos \theta = \frac{\sqrt{5}}{5}$

$\csc \theta = \frac{\sqrt{5}}{2}$

$\sec \theta = \sqrt{5}$

$\cot \theta = \frac{1}{2}$



90. $\frac{5\sqrt{5}}{2\sqrt{10}} = \frac{5\sqrt{5}}{2\sqrt{2}\sqrt{5}} = \frac{5}{2\sqrt{2}} = \frac{5\sqrt{2}}{4}$

94. $\sec \theta = 3, 0 < \theta < \frac{\pi}{2}$

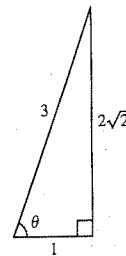
$\sin \theta = \frac{2\sqrt{2}}{3}$

$\cos \theta = \frac{1}{3}$

$\tan \theta = 2\sqrt{2}$

$\csc \theta = \frac{3}{2\sqrt{2}} = \frac{3\sqrt{2}}{4}$

$\cot \theta = \frac{1}{2\sqrt{2}} = \frac{\sqrt{2}}{4}$



Section 5.7 Applications and Models

Solutions to Even-Numbered Exercises

2. $B = 54^\circ, c = 15$

$A = 90^\circ - 54^\circ = 36^\circ$

$\sin B = \frac{b}{c} \Rightarrow b = c \sin B = 15 \sin 54^\circ \approx 12.14$

$\cos B = \frac{a}{c} \Rightarrow a = c \cos B = 15 \cos 54^\circ \approx 8.82$

4. $A = 7.4^\circ, a = 40.5$

$B = 90^\circ - 7.4^\circ = 82.6^\circ$

$\tan A = \frac{a}{b} \Rightarrow b = \frac{a}{\tan A} = \frac{40.5}{\tan 7.4^\circ} \approx 311.83$

$\sin A = \frac{a}{c} \Rightarrow c = \frac{a}{\sin A} = \frac{40.5}{\sin 7.4^\circ} \approx 314.45$

6. $a = 25, c = 35$

$$b = \sqrt{c^2 - a^2} = \sqrt{35^2 - 25^2} = \sqrt{600} \approx 24.49$$

$$\begin{aligned} \sin A = \frac{a}{c} &\Rightarrow A = \arcsin \frac{a}{c} \\ &= \arcsin \frac{25}{35} \approx 45.58^\circ \end{aligned}$$

$$\begin{aligned} \cos B = \frac{a}{c} &\Rightarrow B = \arccos \frac{a}{c} \\ &= \arccos \frac{25}{35} \approx 44.42^\circ \end{aligned}$$

10. $B = 65^\circ 12', a = 14.2$

$$A = 90^\circ - B = 90^\circ - 65^\circ 12' = 24^\circ 48'$$

$$\begin{aligned} \cos B = \frac{a}{c} &\Rightarrow c = \frac{a}{\cos B} \\ &= \frac{14.2}{\cos 65^\circ 12'} \approx 33.85 \end{aligned}$$

$$\begin{aligned} \tan B = \frac{b}{a} &\Rightarrow b = a \tan B \\ &= 14.2 \tan 65^\circ 12' \\ &\approx 30.73 \end{aligned}$$

14. $\theta = 72.94^\circ, b = 3.36 \text{ cm}$

$$\tan \theta = \frac{\text{altitude}}{\left(\frac{b}{2}\right)}$$

$$\text{altitude} = \frac{b}{2} \tan \theta = \frac{3.36}{2} \tan 72.94^\circ \approx 5.47 \text{ cm}$$

18. $\tan(13^\circ) = \frac{h}{58.2}$

$$h = 58.2 \tan(13^\circ) \approx 13.44 \text{ meters}$$

8. $b = 1.32, c = 9.45$

$$a = \sqrt{c^2 - b^2} \approx 9.36$$

$$\cos A = \frac{b}{c} \Rightarrow A = \arccos\left(\frac{1.32}{9.45}\right) \approx 81.97^\circ$$

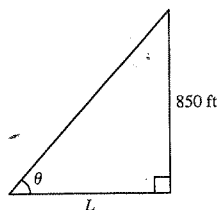
$$\sin B = \frac{b}{c} \Rightarrow B = \arcsin\left(\frac{1.32}{9.45}\right) \approx 8.03^\circ$$

12. $\theta = 18^\circ, b = 10 \text{ meters}$

$$\tan \theta = \frac{\text{altitude}}{b/2}$$

$$\begin{aligned} \text{altitude} &= \frac{b}{2} \tan \theta \\ &= \frac{10}{2} \tan 18^\circ \approx 1.62 \text{ meters} \end{aligned}$$

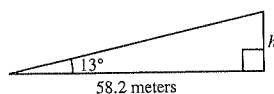
16. (a)



(b) $\tan \theta = \frac{850}{L} \Rightarrow L = \frac{850}{\tan \theta} = 850 \cot \theta$

θ	10°	20°	30°	40°	50°
L	4821	2335	1472	1013	713

(d) No, the cotangent function is not a linear function.



$$20. \tan 28^\circ = \frac{a}{100} \Rightarrow a = 100 \tan 28^\circ$$

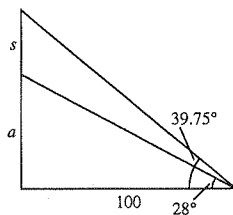
$$\tan 39.75^\circ = \frac{a+s}{100}$$

$$a+s = 100 \tan 39.75^\circ$$

$$s = 100 \tan 39.75^\circ - a$$

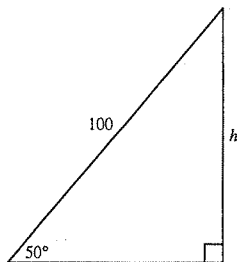
$$= 100 \tan 39.75^\circ - 100 \tan 28^\circ$$

$$\approx 30 \text{ feet}$$

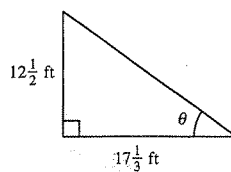


$$22. \sin 50^\circ = \frac{h}{100}$$

$$h = 100 \sin 50^\circ \approx 76.6 \text{ feet}$$



24. (a)



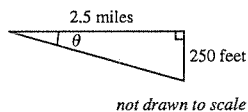
$$(b) \tan \theta = \frac{12\frac{1}{2}}{17\frac{1}{3}}$$

$$(c) \theta = \arctan \frac{12\frac{1}{2}}{17\frac{1}{3}} \approx 35.8^\circ$$

$$26. \tan \theta = \frac{250}{2.5(5280)}$$

$$\theta = \arctan \left(\frac{250}{2.5(5280)} \right)$$

$$\approx 1.09^\circ$$



$$28. \sin 18^\circ = \frac{h}{275(s)}$$

$$s = \frac{h}{275 \sin 18^\circ}$$

$$\text{If } h = 10,000, s = \frac{10,000}{275 \sin 18^\circ} \approx 117.7 \text{ seconds}$$

$$\text{If } h = 16,000, s = \frac{16,000}{275 \sin 18^\circ} \approx 188.3 \text{ seconds}$$

