East Los Angeles College
Department of Mathematics
Math 241
Test 2

Solutions

$$y = \tan(2\pi x)$$

k

38 ✓

Determine the following.

1. Period

(1) $P = \frac{\pi}{k}$

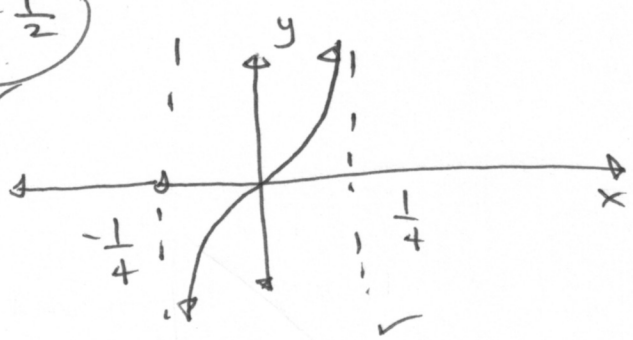
2. Period of one cycle

$P = \frac{\pi}{2\pi}$

3. Sketch the curve

$P = \frac{1}{2}$ ✓

(3)



✓ ✓

(2)

$(6x, \pi)$

$\left(-\frac{\pi}{2k}, \frac{\pi}{2k}\right)$

$\left(-\frac{1}{4}, \frac{1}{4}\right)$

✓ ✓

$$y = -\cot\left(\frac{1}{3}x\right)$$

k

Determine the following.

4. Period

(1) $P = \frac{\pi}{k}$ ✓

10 ✓

5. Period of one cycle

6. Sketch the curve

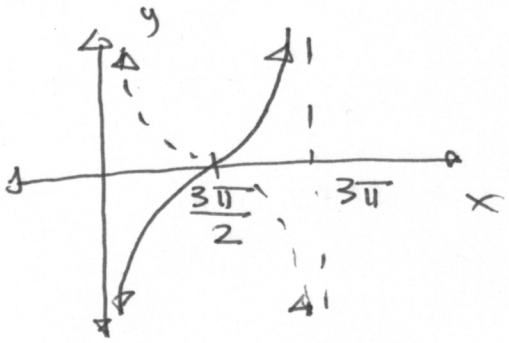
$P = \frac{\pi}{1/3}$

$P = 3\pi$

$(0, \frac{\pi}{2k})$

$(0, 3\pi)$ ✓

✓



✓

✓

7. **Speed of a Car-** The wheels of a car have a 12-inch radius wheel and is rotating at 620 RPM. What is the speed of the car in mph? (miles per hour)

$$V = r\omega$$

$$V = 12\,\text{inch} \cdot 620\,\frac{\text{rev}}{\text{min}} \cdot \frac{2\pi}{1\,\text{rev}} \cdot \frac{60\,\text{min}}{\text{h}} \cdot \frac{1\,\text{ft}}{12\,\text{inch}}$$

$$\text{i.e., } V = \frac{12 \cdot 620 \cdot 2\pi \cdot 60 \cdot 1}{12 \cdot} \frac{\text{ft}}{\text{h}} \cdot \frac{1\,\text{mile}}{5280\,\text{ft}}$$

$$V = \frac{620 \cdot 2\pi \cdot 60}{5280} \frac{\text{mile}}{\text{h}} \; ; \; \boxed{V \simeq 44.2\ \text{mph}}$$

4✓

8. **Truck Wheels-** A truck with 36-inch wheels (diameter) is traveling at 65 mph. $r = 18$ inch
(a) Find the angular speed in rad/min.
(b) How many RPM's does the wheel make?

4✓

(a) $V = r\omega \; ; \; \omega = \frac{V}{r}$

$$\omega = \frac{65\,\text{miles}}{18\,\text{inch hour}} \cdot \frac{1\,\text{h}}{60\,\text{min}} \cdot \frac{5280\,\text{ft}}{1\,\text{mile}} \cdot \frac{12\,\text{inch}}{1\,\text{ft}}$$

$$\omega = \frac{65 \cdot 5280 \cdot 12}{18 \cdot 60} \frac{\text{rad}}{\text{min}} \; ; \; \boxed{\omega \simeq 3813\ \frac{\text{rad}}{\text{min}}}$$

(b) Rev per min

3✓ 8✓

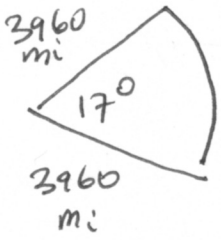
$$\omega = 3813\,\frac{\text{rad}}{\text{min}} \cdot \frac{1\,\text{rev}}{2\pi\,\text{rad}}$$

$$= \frac{3813}{2 \cdot 3.14} \frac{\text{rev}}{\text{min}} \; ; \; \boxed{\omega \simeq 607\ \text{rpm}}$$

10✓

9. **Latitudes-** Two cities lie on the same meridian. City A is located at 35 degrees North and City B is located at 18 degrees North. Determine the distance between the two cities, if the radius of the Earth is 3,960 miles.

See Scratch



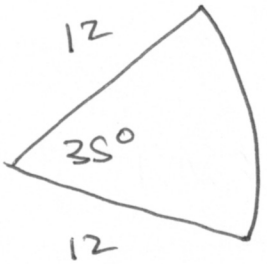
$$S \approx \frac{3960 \cdot 17 \cdot \pi}{180} \quad \pi \approx 3.14 \quad \text{miles}$$

$$S \approx 1{,}174 \text{ miles}$$

4 ✓

10. Sector- The central angle of a sector measures 35 degrees and has a radius of 12 cm. Determine the area of the sector.

See Scratch



$$A = \frac{1}{2} r^2 \theta$$

$$A = \frac{1}{2} 12^2 \, 35^\circ \cdot \frac{\pi}{180^\circ}$$

$$A \approx 43.96 \text{ cm}^2$$

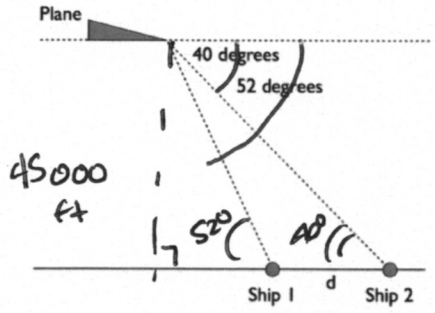
4 ✓

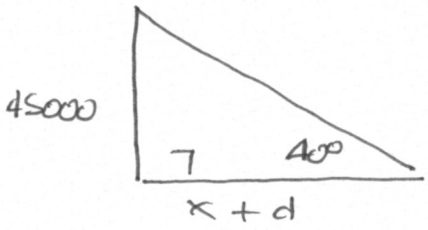
✓2

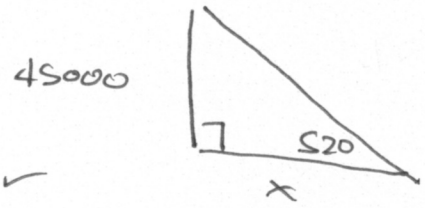
8 ✓

11. **Distance Between Ships**- A pilot measures the angles of depression to two ships to be 40 degrees and 52 degrees respectively. If the pilot is flying at an elevation of 45,000 feet,
(a) What is the distance between the two ships?
(b) What is the altitude of the plane?

See Scratch





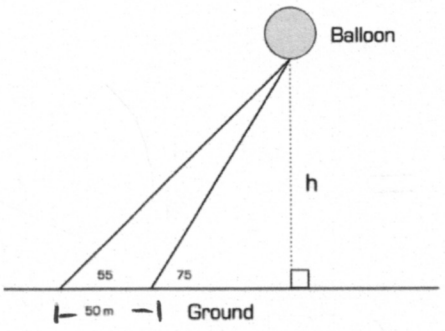


$\tan(40^\circ) = \frac{45000}{x+d}$; $\tan(52^\circ) = \frac{45000}{x}$

$$d = \frac{45000 - 45000\,\frac{\tan(40)}{\tan(52)}}{\tan(40)}$$

$d \approx 16,471$ ft

12. An observer measures an angle of elevation of a balloon to be 55 degrees and walks 50 meters to measure a second angle of elevation of the same balloon to be 75 degrees. What is the altitude of the balloon?



See Scratch.

Scratch

$$\tan(55^\circ) = \frac{h}{50+x} \quad ; \quad \tan(75^\circ) = \frac{h}{x}$$

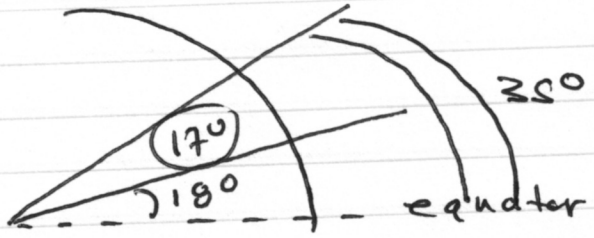
$$x = \frac{h}{\tan(75^\circ)}$$

$$\Rightarrow h = \frac{50 + \tan(55^\circ)}{1 - \frac{\tan(55^\circ)}{\tan(75^\circ)}}$$

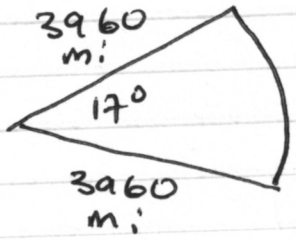
$$\boxed{h \approx 115.7 \text{ m}}$$

S

(9)



is Sector



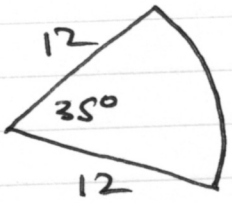
$s = r\theta$

$S = 3960 \text{ miles } 170 \frac{\pi}{180}$

$S = \frac{3960 \cdot 17 \cdot \pi}{180}$ miles ($\pi \approx 3.14$)

$S \approx 1,174$ miles

(10)



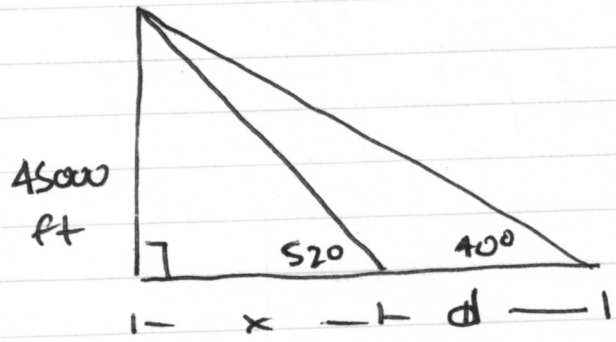
$A = \frac{1}{2} r^2 \theta$

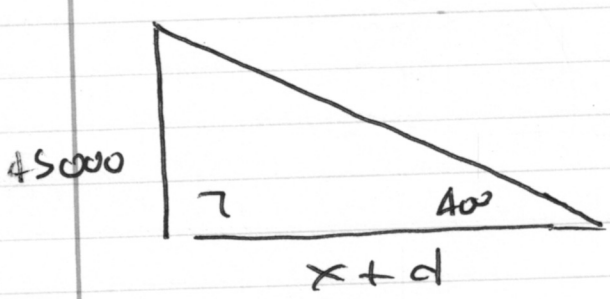
$A = \frac{1}{2} 12^2 350 \cdot \frac{\pi}{180}$

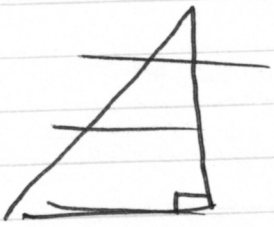
$A = \frac{1}{2} \cdot \frac{144 \cdot 35 \cdot \pi}{180}$

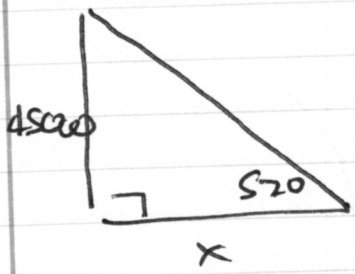
$A = \frac{144 \cdot 35 \cdot 3.14}{360}$; $A \approx 43.96 \text{ cm}^2$

(11)









$$\tan(40^\circ) = \frac{45000}{x+d}$$

$$\tan(52^\circ) = \frac{45000}{x}$$

ie, $(x+d)\tan(40^\circ) = 45000$

$$x = \frac{45000}{\tan(52^\circ)}$$

$$\tan(40^\circ)x + d\tan(40^\circ) = 45000$$

$$d = \frac{45000}{\tan(52^\circ)}$$

$$\frac{45000 \tan(40°)}{\tan(52°)} + d \tan(40°) = 45000$$

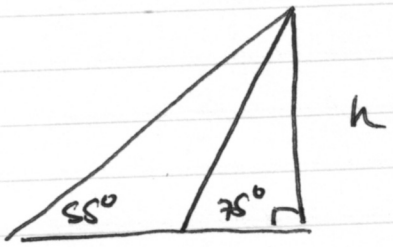
$$d \tan(40°) = 45000 - \frac{45000 \tan(40)}{\tan(52)}$$

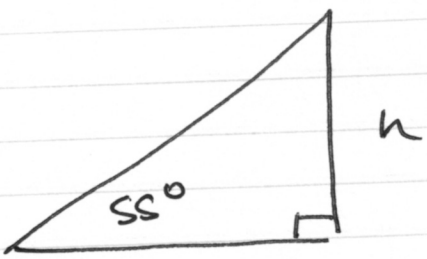
$$d = \frac{45000 - \frac{45000 \tan(40)}{\tan(52)}}{\tan(40)}$$

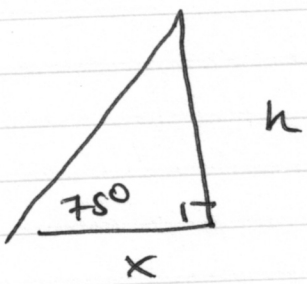
$$d \approx \frac{45000 - 29501}{\tan(40)}$$

$$\boxed{d \approx 18,471 \text{ ft}}$$

(12)







$$\tan(55°) = \frac{h}{50+x} \quad ; \quad \tan(75°) = \frac{h}{x}$$

$$x = \frac{h}{\tan(75°)}$$

$$(x + 50)\tan(55°) = h$$

$$\left(\frac{h}{\tan(75°)} + 50\right)\tan(55°) = h$$

$$h\,\frac{\tan(55°)}{\tan(75°)} + 50\tan(55°) = h$$

$$50\tan(55°) = h - h\,\frac{\tan(55°)}{\tan(75°)}$$

$$\text{So } \tan(55^\circ) = h\left[1 - \frac{\tan(55^\circ)}{\tan(75^\circ)}\right]$$

$$h = \frac{\text{So } \tan(55^\circ)}{1 - \frac{\tan(55^\circ)}{\tan(75^\circ)}}$$

$$h \simeq \frac{\text{So } \tan(55^\circ)}{0.61733}$$

$$\boxed{h \simeq 115.7 \text{ m}}$$