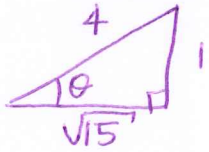
Math 1160K - Fall 2014
Quiz 1 – Take Home
Due: Monday, September 22

Name: KEY

1. ($1\frac{1}{2}$ points) Given that $\sin\theta = \frac{1}{4}$ and $0 < \theta < \frac{\pi}{2}$, find the exact value of the five remaining trigonometric functions.



$\sin\theta = \frac{1}{4}$ $\quad \csc\theta = 4$

$\cos\theta = \frac{\sqrt{15}}{4}$ $\quad \sec\theta = \frac{4}{\sqrt{15}}$

$\tan\theta = \frac{1}{\sqrt{15}}$ $\quad \cot\theta = \sqrt{15}$

2. (1 point) A neighborhood carnival has a merry-go-round which is 50 feet across. If the time for one revolution is 30 seconds, how fast is the merry-go-round going?

$r = 25$ ft

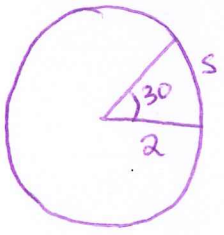
$\frac{1 \text{ rev}}{30 \text{ sec}} \cdot \frac{2\pi}{1 \text{ rev}} = \frac{2\pi}{30 \text{ sec}} = \omega$

$v = r\omega$

$= 25\left(\frac{2\pi}{30}\right)$

$= \frac{50\pi}{30} = \boxed{\frac{5\pi}{3} \text{ feet/sec}}$

3. (1 point) Find the length of the arc subtended by a central angle of 30° in a circle of radius 2 feet. What is the sector's area?



$s = r\theta$

$s = 2\left(\frac{\pi}{6}\right)$

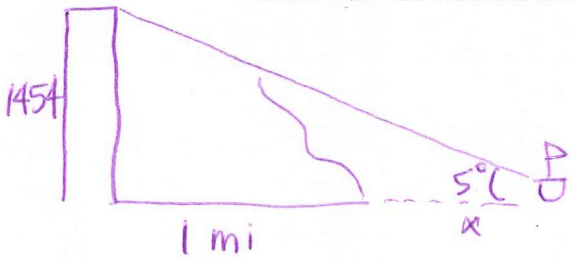
$\boxed{s = \frac{\pi}{3} \text{ ft}}$

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

$= \frac{1}{2}(4)\left(\frac{\pi}{6}\right)$

$\boxed{A = \frac{\pi}{3} \text{ ft}^2}$

4. ($1\frac{1}{2}$ points) The Willis Tower in Chicago is 1454 feet tall and situated 1 mile inland from the shore of Lake Michigan. An observer in a boat on the lake directly in front of the tower looks at the top of the tower and measures an angle of elevation of 5°. How far offshore is the boat?



$\tan 5° = \frac{1454}{5280 + x}$

$5280 + x = \frac{1454}{\tan 5°}$

$x = -5280 + \frac{1454}{\tan 5°} = 11{,}339.30 \text{ ft}$

$\doteq 2.15 \text{ mi}$

$\therefore$ the ship is approximately 2.15 mi from shore