MA 154 Exam 1 Fall 2001

Name: _____

Place your answers in the spaces provided. You must show correct work to receive credit.

(8 pts.) 1. Find the exact radian measure of $40°$.

$$\left(\frac{40°}{1}\right)\left(\frac{\pi}{180°}\right) = \frac{40\pi}{180} = \frac{4\pi}{18} = \frac{2}{9}\pi$$

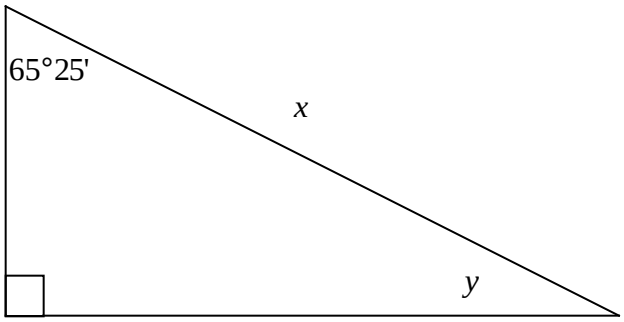
$$\frac{2\pi}{9} \text{ or } \frac{2}{9}\pi$$

(8 pts.) 2. Find the angle that is supplementary to $\theta = 15°\,31'14"$.

$$\begin{array}{rr} 180°\ 00'\ 00" & 179°\ 59'\ 60" \\ \underline{-15°\ 31'\ 14"} & \underline{-15°\ 31'\ 14"} \\ & 164°\ 28'\ 46" \end{array}$$

164° 28' 46"

(12 pts.) 3. Approximate the values of *x*, to one decimal place, and *y*, to the nearest minute.



15 meters

$$\begin{array}{rr} 90°\ 00' & 89°\ 60' \\ \underline{-65°\ 25'} & \underline{-65°\ 25'} \\ & 24°\ 35' \end{array}$$

$$\sin 65°25' = \frac{15}{x}$$

$$x = \frac{15}{\sin 65.41\overline{6}°}$$

$$x = \frac{15}{0.909}$$

$$x = 16.5$$

$x =$ 16.5 meters

$y =$ 24° 35'

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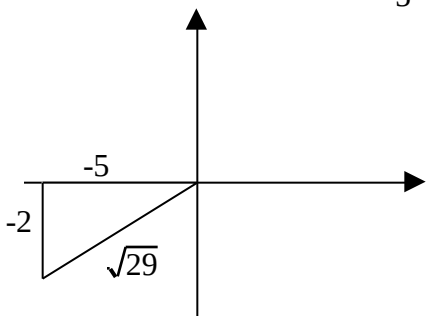
(8 pts.) 4. If $\tan\theta = \frac{2}{5}$ and $\cos < 0$, find the exact value of $\csc\theta$. Draw and label a diagram.



$2^2 + 5^2 = c^2$

$4 + 25 = c^2$

$29 = c^2$

$c = \sqrt{29}$

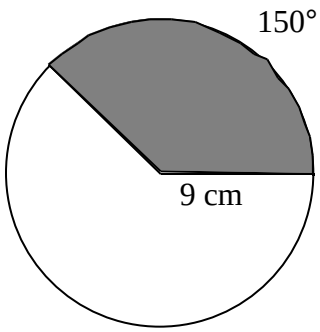
$\csc\theta = \frac{hyp}{opp}$

$\csc\theta = \frac{\sqrt{29}}{2}$

$-\frac{\sqrt{29}}{2}$

(14 pts.) 5. Given the diagram:

~~(6 pts.)~~ (14 pts.) a) Find the exact length of the arc of the shaded region.



$s = r\theta$

$s = 9\left(150°\right)\left(\frac{\pi}{180°}\right)$

$s = 9\left(\frac{15\pi}{18}\right)$

$s = \frac{15}{2}\pi$

(0 pts.) ~~(8 pts.)~~ b) Find the exact area of the shaded region.

Not covered in homework.

Length of arc: $\frac{15}{2}\pi cm$ *or* 7.5π *cm*

Area of shaded region: Do not do.

(10 pts.) 6. Approximate to the nearest 0.01 radian, all the angles θ in the interval $[0, 2\pi)$ that satisfy the equation $\sin\theta = -0.9876$.

$\sin\theta = -0.9876$

$\theta = -1.413$

$\theta_R = 1.413$

$\pi + 1.413 = 4.55$

$2\pi - 1.413 = 4.87$

4.55, 4.87

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(10 pts.) 7. For a given sine curve, the amplitude is 5, the period is π and the phase shift is $-\frac{\pi}{6}$. Write its equation in $y = a\sin(bx + c)$ form, for $a > 0$, $b > 0$ and the least positive real number c.

$a = 5$

$\pi = \frac{2\pi}{|b|}$

$|b| = \frac{2\pi}{\pi}$

$b = 2$

$-\frac{\pi}{6} = \frac{-c}{b}$

$-\frac{\pi}{6} = \frac{-c}{2}$

$\frac{2\pi}{6} = c$

$c = \frac{\pi}{3}$

$y = 5\sin\left(2x + \frac{\pi}{3}\right)$

(10 pts.) 8. Verify the identity.

$$\frac{\tan\theta + 1}{\sec\theta} = \sin\theta + \cos\theta$$

$$\frac{\frac{\sin\theta}{\cos\theta} + 1}{\frac{1}{\cos\theta}} = \sin\theta + \cos\theta$$

$$\frac{\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\cos\theta}}{\frac{1}{\cos\theta}} = \sin\theta + \cos\theta$$

$$\frac{\frac{\sin\theta + \cos\theta}{\cos\theta}}{\frac{1}{\cos\theta}} = \sin\theta + \cos\theta$$

$$\frac{\sin\theta + \cos\theta}{\cos\theta} \quad \frac{\cos\theta}{1} = \sin\theta + \cos\theta$$

$$\sin\theta + \cos\theta = \sin\theta + \cos\theta$$

OR:

$$\frac{\tan\theta}{\sec\theta} + \frac{1}{\sec\theta} = \sin\theta + \cos\theta$$

$$\frac{\frac{\sin\theta}{\cos\theta}}{\frac{1}{\cos\theta}} + \cos\theta = \sin\theta + \cos\theta$$

$$\left(\frac{\sin\theta}{\cos\theta}\right)\left(\frac{\cos\theta}{1}\right) + \cos\theta = \sin\theta + \cos\theta$$

$$\sin\theta + \cos\theta = \sin\theta + \cos\theta$$

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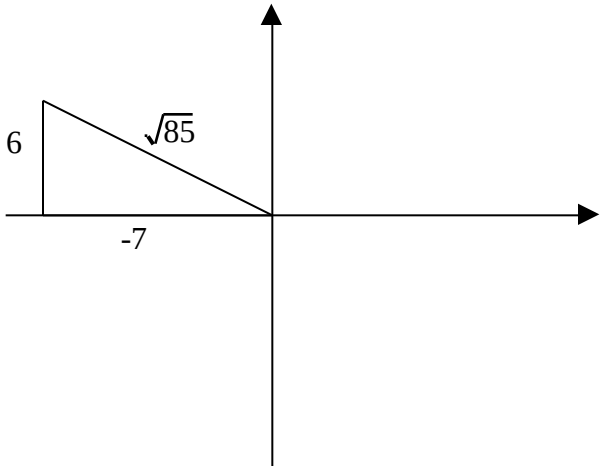
(8 pts.) 9. If θ is in standard position and P is on the terminal side, find the exact value of $\sin\theta$ for $P(-7,6)$.



$6^2 + 7^2 = c^2$

$36 + 49 = c^2$

$85 = c^2$

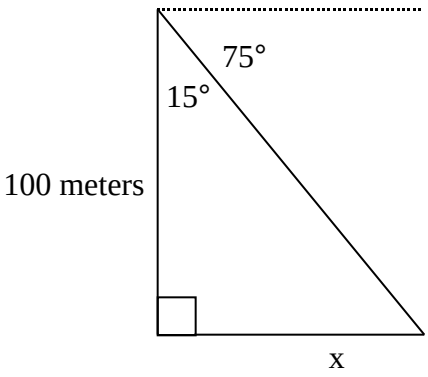
$c = \sqrt{85}$

$\sin\theta = \frac{opp}{hyp}$

$\sin\theta = \frac{6}{\sqrt{85}}$

$\frac{6}{\sqrt{85}}$

(12 pts.) 10. From the edge of a cliff 100 meters above level ground, a hiker measures the angle of depression to a friend on the ground to be $75°$. If the hiker drops his knapsack off the cliff and it lands on the ground directly below him, approximate the distance his friend will have to walk to retrieve it. Draw and label a diagram, set up an equation and solve. Round your answer to the nearest meter.



x = the distance the friend has to walk.

$\tan 15° = \frac{x}{100}$

$100(\tan 15°) = x$

$100(0.2679) = x$

$26.79 = x$

27 meters