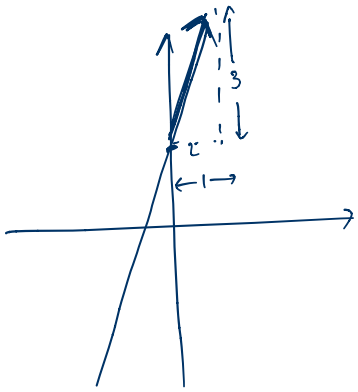
Name: SOLUTIONS Student ID:

MATH 53, QUIZ 2: STEWART 10.4-12.3

Be sure to show neat, organized, complete work in the space provided.

1. Find the two **unit vectors** in $\mathbb{R}^2$ satisfying the stated conditions.

   (a) Parallel to the line $y = 3x + 2$

   Slope is 3. So a parallel vector is given by $\langle 1, 3 \rangle$.

   Normalize: $\frac{1}{\sqrt{1^2+3^2}}\langle 1,3\rangle = \frac{1}{\sqrt{10}}\langle 1,3\rangle$.

   The other answer is the negative of this.

   Answers: $\frac{1}{\sqrt{10}}\langle 1,3\rangle$ and $\frac{-1}{\sqrt{10}}\langle 1,3\rangle$

   (b) Perpendicular to the line $x + y = 1$

   $1x + 1y = 1$

   so $\langle 1,1\rangle$ is perpendicular to the line.

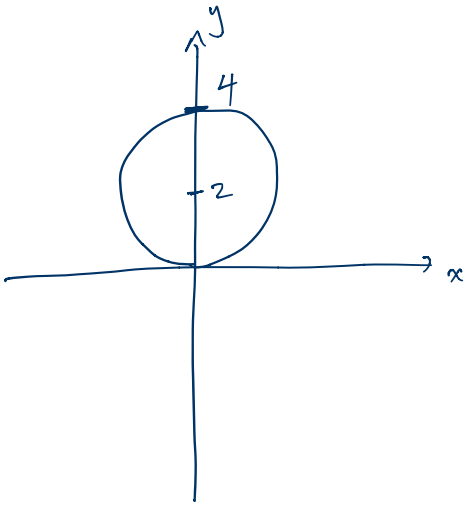
   Normalize by dividing by its magnitude, which is $\sqrt{2}$.

   Answers: $\frac{1}{\sqrt{2}}\langle 1,1\rangle$ and $\frac{-1}{\sqrt{2}}\langle 1,1\rangle$

(Continued on back.)

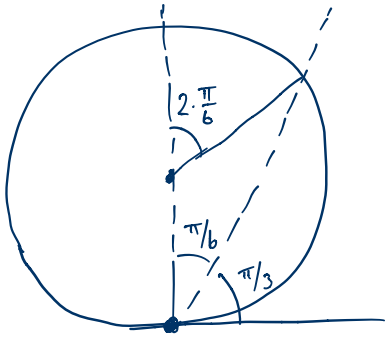
2. Consider the polar curve $r = 4\sin(\theta)$.

(a) Sketch a picture in the xy-plane of this polar curve for $0 \le \theta \le \pi$.



circle of radius 2 centered @ (0,2)

(b) Calculate the exact length of the portion of the curve with $\pi/3 \le \theta \le \pi/2$. Whether you use calculus or some other method is up to you.



Arclength formula:

$$\int_{\pi/3}^{\pi/2} \sqrt{16\sin^2\theta + 16\cos^2\theta}\, d\theta$$

$$= 4\int_{\pi/3}^{\pi/2} d\theta = 4\cdot\frac{\pi}{6} = \boxed{\frac{2\pi}{3}}$$

– OR – use picture to right to see it is $\frac{1}{6}$ of the whole circle, which has circumference 4π.
So again, $4\pi/6$.

Final answer: $2\pi/3$

Feedback: If you have any feedback you'd like to share, please write it here. If there are any specific topics you are confused about, feel free to write them here as well.