

### Take-home Quiz 4

**Note:** Please, have your quiz solutions written on regular letter-size paper and stapled before you submit it.

!!!!!!Submit only 4 of these problems!!!!!!

- (10 points) Obtain the cartesian equation for the parametric curve  $x = 3\sqrt{t-3}$ ,  $y = 2\sqrt{4-t}$  where  $3 \leq t \leq 4$  and graph the curve.
- (10 points) Two vectors  $u = \langle 1, -3 \rangle$ ,  $v = \langle -1, 2 \rangle$  are given.
  - Find the cosine of the angle between  $u$  and  $v$ .
  - Find the unit vector on the direction of  $2u + 3v$
- (10 points) The position of a moving particle at time  $t$  is given by  $r(t) = \tan t \mathbf{i} + \sin t \mathbf{j}$ . Find its velocity, speed and acceleration when  $t_1 = \frac{\pi}{6}$  and sketch a portion of its graph containing  $t_1$  and draw  $v(\frac{\pi}{6})$  and  $a(\frac{\pi}{6})$  with their initial points at P.
- (10 points) An object moves along the parabola  $y = x^2$  with constant speed.
  - Express its acceleration  $\mathbf{a}$  at the point  $(x, x^2)$  in terms of its unit tangential and normal vectors  $\mathbf{T}$  and  $\mathbf{N}$  and then in terms of  $\mathbf{i}$  and  $\mathbf{j}$ .
- (10 points) Find the equation of the plane through  $(-1, 2, -3)$  and parallel to the plane  $2x + 4y - z = 6$

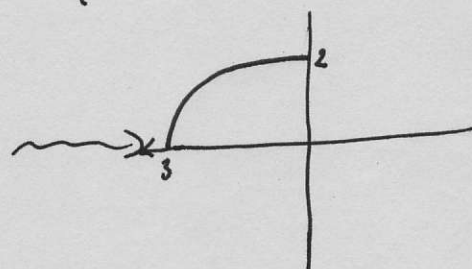
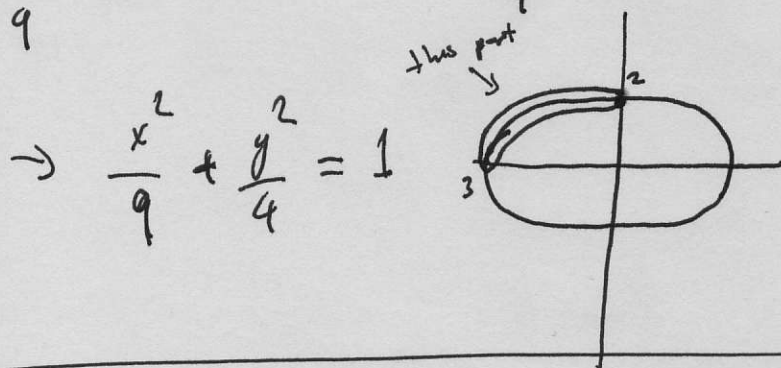
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①  $x = 3\sqrt{t-3}$      $y = 2\sqrt{4-t}$

$x^2 = 9(t-3)$      $y^2 = 4(4-t)$

$x^2 + 27 = 9t$      $y^2 - 16 = -4t$

$\frac{x^2}{9} + 3 = t = 4 - \frac{y^2}{4} \rightarrow \frac{x^2}{9} + \frac{y^2}{4} = 1 \quad 3 \leq t \leq 4$



②  $\cos \theta = \frac{u \cdot v}{|u| \cdot |v|} = \frac{-1 - 6}{\sqrt{1+9} \sqrt{1+4}} = \frac{-7}{\sqrt{50}} //$

b  $\left( \frac{\text{unit vector in the direction of } 2u+3v}{\text{of } 2u+3v} \right) = w = \frac{2u+3v}{|2u+3v|} = \frac{2\langle 1, -3 \rangle + 3\langle -1, 2 \rangle}{|2u+3v|}$

$= \frac{\langle 2-3, -6+6 \rangle}{|2u+3v|} = \frac{\langle -1, 0 \rangle}{1} = \langle -1, 0 \rangle$