## Math 233 - Quiz 5 (IC)

February 24, 2022

Name	keu	
	. 7	Score

Show all work to receive full credit. Supply explanations when necessary.

1. (2 points) A projectile is fired from 1 meter above the ground at an angle of  $60^{\circ}$  with the horizontal. The initial speed of the projectile is  $158 \,\mathrm{m/sec}$ . What is the maximum height of the projectile? (Use  $g = 9.8 \,\mathrm{m/sec^2}$ .)

$$\hat{\Gamma}(t) = 158 \cos 60^{\circ} + \hat{c} + (-4.9 t^{2} + 158 \sin 60^{\circ} + + 1)\hat{j}$$

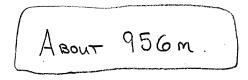
$$= 79 + \hat{c} + (-4.9 t^{2} + 79 \sqrt{3} + + 1)\hat{j}$$

$$\chi(t)$$

$$y(t)$$

$$y'(t) = -9.8t + 79\sqrt{3} = 0 \implies t = \frac{79\sqrt{3}}{9.8} \approx /3.96 \text{ sec}$$

$$y(\frac{79\sqrt{3}}{9.8}) \approx 956.26 \text{ m}$$



2. (1 point) Describe the graph of a vector-valued function for which the curvature is 0 for all values of t in its domain.

THE GRAPH IS A LINE.

## Math 233 - Quiz 5 (TH)

February 24, 2022

Name <sub>-</sub>	key	
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Show all work to receive full credit. Supply explanations when necessary. This 7-point, take-home portion of the quiz is due March 1.

1. (4 points) A projectile is fired from ground level at an angle of 8° with the horizontal. The projectile is to have a range of 50 meters. Find the required initial velocity and the maximum height of the projectile.

Range of 50m 
$$\Rightarrow$$
  $V_0 \cos 8^\circ t = 50$ 

$$-4.9t^3 + V_0 \sin 8^\circ t = 0$$

$$t \left(-4.9t + V_0 \sin 8^\circ\right) = 0$$

$$t = 0 \text{ or } t = \frac{V_0 \sin 8^\circ}{4}$$

$$\frac{V_{0} \cos 8^{\circ} V_{0} \sin 8^{\circ}}{4.9} = 50$$

$$V_{0}^{2} = \frac{345}{\cos 8^{\circ} \sin 8^{\circ}} \approx 1777.7$$

Vo ≈ 43.16 m/sec

MAX HEIGHT ...

$$-9.8 + V_0 sin 8^\circ = 0$$
  
 $\Rightarrow t = \frac{V_0 sin 8^\circ}{9.8} \approx 0.59877$ 

THIS t-VALUE MAKES

Turn over.

2. (3 points) An object is launched from the ground with an initial speed of 80 ft/sec and at an angle of 60° with the horizontal. Set up the definite integral that gives the length of the path of the object. Then use technology to estimate the value of the integral.

$$\vec{\Gamma}(t) = 80 \cos 60^{\circ} t \ \hat{c} + (-16t^{3} + 80 \sin 60^{\circ} t) \hat{c}$$

$$= 40t \hat{c} + (-16t^{3} + 40\sqrt{3} t) \hat{c}$$
Hits ground when  $-16t^{3} + 40\sqrt{3} t = 0$ 

$$t (-16t + 40\sqrt{3}) = 0$$

$$t = 0, t = \frac{40\sqrt{3}}{16} = \frac{5\sqrt{3}}{3}$$

$$\vec{\Gamma}'(t) = 40.2 + (-3.2 + 40.13).$$
Arc LwgTH = 
$$\int_{0}^{5\sqrt{3}} (40)^{3} + (-3.2 + 40.13)^{3} dt$$

$$\approx 339.053 \text{ FT}$$