Math 233 - Quiz 3

Name _____

February 25, 2021

Score _____

Show all work to receive full credit. Supply explanations when necessary. This quiz is due March 4.

1. (3 points) A projectile is launched from a bench above the ground. It is launched with an initial speed of 100 feet per second and at an angle of 30° above the horizontal. The projectile hits the ground after it has covered a horizontal distance of 276 ft. How high is the bench?

2. (2 points) Reparameterize the position vector below in terms of the arc length parameter.

$$\vec{r}(t) = (2+3t)\hat{\imath} - 5t\hat{\jmath} + (1+t)\hat{k}, \qquad 0 \le t \le 2$$

Turn over.

3. (2 points) At what point does the graph of $y = x^2$ have the greatest curvature? Find a set of parametric equations for the graph. Then compute the curvature at the point of greatest curvature.

4. (3 points) Find the principal unit normal vector at $t = 0$.

$$\vec{r}(t) = \sqrt{2}\, t\hat{\imath} + e^t\hat{\jmath} + e^{-t}\hat{k}$$