7. [6 points] The function $r(t)$, defined for all real numbers t, gives the position of a particle moving along the unit circle, where

$$r(t) = (\cos(t - t^3), \sin(t - t^3)).$$

a. [3 points] Find all values of t where the particle stops moving.

Answer: $t =$ _____

b. [3 points] For which values of t is the particle moving counterclockwise?

Answer: _____

8. [8 points] Let $f(x) = xe^{-x^2}$.

a. [4 points] Find the first four nonzero terms of the Taylor series for $f(x)$ centered at $x = 0$.

Answer: _____

b. [2 points] Find the value of $f^{(18)}(0)$.

Answer: $f^{(18)}(0) =$ _____

c. [2 points] Compute the limit

$$\lim_{x \to 0} \frac{xe^{-x^2} - x}{5x^3}.$$

Answer: $\lim_{x \to 0} \frac{xe^{-x^2} - x}{5x^3} =$ _____