

Quiz 4 (20 points in total)
Section 201/202 (circle one)
Name:

1. [6 points] Suppose $f(x) = e^{x^2}$.

(1) [2 points] Find the tangent line approximation of $f(x)$ at $x = 1$.

(2) [2 points] Use your answer in part (1) to estimate $e^{1.01^2}$.

(3) [2 points] Is your estimation in part (2) an overestimate or underestimate? Use concavity to explain your answer.

2. [6 points] Suppose that x and y satisfy the relation given by the curve

$$x^2 + xy + y^2 = 3$$

(1) [3 points] Find $\frac{dy}{dx}$ (in other words, y').

(2) [3 points] Find all points on the curve at which the tangent line is horizontal.

3. [8 points] Let $f(x) = x^2(x - 1)^2$. Find all the critical points of $f(x)$ and use either the first derivative test or the second derivative test to classify these critical points as a local max, local min, or neither. Show all your steps!