

5. [6 points] For each of the following statements, circle True if the statement is always true and circle False otherwise. No justification is necessary.

a. [2 points] If the function  $f(x)$  is continuous on the interval  $(0, 100)$ , then  $f(x)$  has a global maximum and a global minimum on that interval.

True                  False

b. [2 points] If  $f(x)$  is a differentiable function with a critical point at  $x = c$ , then the function  $g(x) = e^{f(x)}$  also has a critical point at  $x = c$ .

True                  False

c. [2 points] If  $f'(x)$  is continuous and  $f'(x) \neq 0$  for all  $x$ , then  $f(0) \neq f(5)$ .

True                  False

6. [8 points] This problem concerns the implicit curve

$$x^2 + xy + y^2 = 7$$

for which

$$\frac{dy}{dx} = \frac{-y - 2x}{x + 2y}.$$

a. [3 points] Find an equation for the tangent line to the curve at the point  $(1, 2)$ .

b. [5 points] Find the  $x$ - and  $y$ -coordinates of all points on the curve at which the tangent line is vertical.