Quiz 19

Name: _____

1. Find the critical points of $f(x) = xe^{-x}$ and classify them as local minimums or local maximums using the second derivative.

$$f'(x) = e^{-x} - xe^{-x}$$
$$f''(x) = -e^{-x} - \left(e^{-x} - xe^{-x}\right)$$
$$= -2e^{-x} + xe^{-x}.$$

Find critical points:

$$f'(x) = 0$$
$$e^{-x} - xe^{-x} = 0$$
$$e^{-x}(1 - x) = 0$$
$$1 - x = 0$$
$$x = 1.$$

Then plug $x = 1$ into f'':

$$f''(1) = -2e^{-1} + e^{-1} \approx -0.368.$$

This number being negative tells us that f is concave down at the critical point $x = 1$, so $x = 1$ is a local maxmimum.