

Name: \_\_\_\_\_

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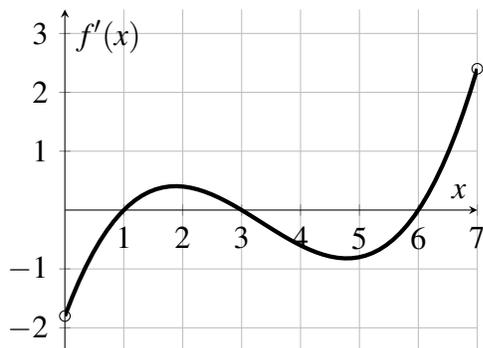
20 points possible. No aids are allowed. Show all work and use proper notation for full credit.

1. [6 points] Compute, with justification, the following limits:

a.  $\lim_{t \rightarrow 0} \frac{\sin(t^2)}{t^2}$

b.  $\lim_{x \rightarrow \infty} e^{-x} \ln(x)$

2. [4 points] The graph of the **derivative**  $f'$  of a function  $f$  is shown.



a. On what intervals is  $f$  increasing or decreasing? Use interval notation.

b. At what values of  $x$  in the open interval  $(0, 7)$  does  $f$  have a local maximum or minimum?

3. [10 points] Consider the function  $f(x) = xe^x$

a. Show that  $f'(-1) = 0$ .

b. Use the first derivative test to determine if a local minimum, a local maximum, or neither occurs at  $x = -1$ .

c. Is  $f(x)$  concave up, concave down, or neither at  $x = -1$ ?

d. What does the previous answer tell you about the critical number  $x = -1$ ?

e. Determine any points of inflection of  $f(x)$ .