

Name:

### QUIZ 4

You must show all of your work for full credit.

**Problem 1** (5 points). A phone manufacturer has determined that the profit  $P(x)$  in thousands dollars is related to the quantity  $x$  of phones produced (in hundreds) per month by

$$P(x) = -(x - 4)e^x - 4.$$

At what production levels is the profit increasing? At what levels is it decreasing?

**Problem 2** (5 points). A group of researchers has found that people prefer training films of moderate length; shorter films contain too little information, while longer films are boring. For a training film on the care of exotic birds, the researchers determined that the ratings people gave for the film could be approximated by

$$R(t) = \frac{20t}{t^2 + 100},$$

where  $t$  is the length of the film in minutes. Find the film length that received the highest rating.

**Problem 3** (10 points). Consider the function  $f(x) = x^4 - 20x^2 + 64$ .

- (a) What are the  $x$ -intercepts of  $f$ ? What is the  $y$ -intercept?
- (b) What are the the critical points of  $f$ ? On what intervals is  $f$  increasing? Decreasing?
- (c) What are the  $x$ -values of the inflection points of  $f$ ? On what intervals is  $f$  concave up? Concave down?
- (d) Sketch a graph of  $f$ .