

**Third Examination**  
*Wednesday, March 22, 2006*

**Instructions:** This exam should be done on your own paper. The answers should be written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each part of each problem is worth 16 points, and 4 points are “free.”

1. Find the derivatives of the following functions.

$$\begin{array}{ll} \text{(a)} & f(x) = x^2 + x + 1 \\ \text{(b)} & g(t) = t \ln t \\ \text{(c)} & h(u) = \frac{e^u}{u} \\ \text{(d)} & f(w) = e^{w^2+1} \end{array}$$

2. Suppose

$$f(x) = \frac{1}{3}x^3 + \frac{3}{2}x^2 + 2x + 1.$$

- (a) Use the derivative to find all critical points of  $f$ .
- (b) Using the second derivative, classify each critical point as corresponding to a local maximum, local minimum, or neither.