

Third Examination
Wednesday, March 22, 2017

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear 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 and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is worth 25 points.

1. Find the following limits.

$$(a) \lim_{x \rightarrow 0} \frac{e^x - 1}{x} \quad (b) \lim_{x \rightarrow \infty} \frac{x}{e^x} \quad (c) \lim_{x \rightarrow \infty} x^2 e^{-x}$$

2. Graph the following function, labeling x -intercepts, y -intercepts, local extrema, and horizontal and vertical asymptotes (if any):

$$R(x) = \frac{3 + x}{2 - x}.$$

Calculate exact values for any critical points (for local extrema) and location of asymptotes and intercepts. Also state intervals where R is concave up and where R is concave down.

3. Find the global maximum and global minimum of the following function. Show all of your work.

$$f(x) = x^3 - 3x + 1, \quad x \in [-2, 0].$$

4. If $f(x) = x^3 - 3x$, find a $c \in [0, 2]$ where $f'(c)$ is equal to the average rate of change of f over $[0, 2]$.