

Calculus Self Test/ Study Guide

This handout presents many of the calculus concepts that will be used in E110. (Suggestions, look up concepts in your old calculus text or check out Tvestlanka Karagyozyova's *CalculusReview* at:

<http://mlovell.web.wesleyan.edu/EconCalc/KaragyozyovaCalcReview.pdf>)

Please deposit your completed Self-Test in the E110 Section 2 slot in the White Lock Box in the alcove around the corner from the Econ Office (123 PAC) as soon as possible – by 12:00 noon, on Friday, September 8th, at the latest.

1. Differentiate the following functions:

a. $y(x) = 36 - 2x^2$

b. $z(x) = (6 - 2x)(x^2)$

c. $f(x) = (ax^2 + b)^3$

d. $y = \ln x$ ($\ln x$ denotes the log of x to the base e)

e. $y = 2 \ln(x^3)$

f. $a(r) = \pi r^2$

2. Consider the function $y(x) = 72 + 8x - 2x^2$, ($0 \leq x \leq 6$)

a. Fill in the blanks in the following table

| | | | | | | |
|----------------------------------|-------|-------|-------|-------|-------|------------|
| x | 0 | 1 | 2 | 4 | 5 | 6 |
| y(x) | 72 | _____ | _____ | _____ | 62 | <u>48</u> |
| dy/dx | _____ | _____ | _____ | -8 | _____ | <u>-16</u> |
| dy ² /dx ² | _____ | _____ | _____ | _____ | _____ | <u>-4</u> |

b. Determine, using the calculus, the value of x, call it x^0 that yields the maximum value of $y(x)$. Show your work. Explain!

c. Determine the second derivative, d^2y/dx^2 , at point x^0 .

d. Explain why it is important to consider the sign of d^2y/dx^2 evaluated at x^0 .