

Friday 04/16/2004

Midterm III

8:30am–9:20am

Name: Student ID: **Instructions.**

1. No calculators or notes.
2. Attempt all five *numbered* questions.
3. Do not write on back of exam sheets. Extra paper is available.
4. Show all the steps of your work clearly.
The method (reasoning) used to obtain an answer is worth more than the answer itself.

Question	Points	Your Score
Q1	6	
Q2	8	
Q3	17	
Q4	12	
Q5	12	
TOTAL	55	

Q1... [6 points] Write down the differential dy of the function $y = \sqrt{x}$.

Use the differential above to give an estimate for $\sqrt{100.2}$.

Q2... [8 points] Compute the absolute maximum and minimum values of the function

$$f(x) = \sin x + \cos x$$

on the interval $[0, \pi/3]$.

Q3]... [15 points] Sketch the graph of the function $f(x) = 3x^5 = 5x^3$. Include all the information that you can learn from f' and f'' by answering the questions below. You have an extra page overleaf.

1. Compute $f'(x)$. _____
2. Compute $f''(x)$. _____
3. Intervals where f is increasing. _____
4. Intervals where f is decreasing. _____
5. Intervals where f is concave up. _____
6. Intervals where f is concave down. _____
7. Critical points; (local max/min, neither). _____
8. Points of inflection. _____
9. x - and y -intercepts. _____

Extra space for Q3.

Q4]... [10 points] Find the maximum volume of a (right, circular) cylinder which can be inscribed inside a (right, circular) cone of base radius R and height H . Your answer will involve R and H .

Q5]... [10 points] A 10 foot long ladder rests against a vertical wall as shown in the diagram. Suppose that the end of the ladder is pulled away from the base of the wall at a constant rate of 2ft/sec. Determine the rate of change of the angle that the ladder makes with the vertical wall at the instant when the foot of the ladder is 6ft from the base of the wall.

Bonus Question... Show that the equation

$$1 + 2x + x^3 + 4x^5 = 0$$

has exactly one real root.