MATH 160 Session #29 Review Exercises

If F is any function such that F'(x) = f(x), then $\int_a^b f(x)dx$ = F(b) – F(a) = $F(x)\Big|_a^b$.

Some exercises to be done without calculator and without note card.

1. **Sketch the graph of $f(x) = -3x^2 + 24x$ for $0 \le x \le 8$.**

2. **Show how to determine f '(x) using the definition of the derivative if $f(x) = -3x^2 + 24x$.**

3. **Show how to determine the equation of the line tangent to the graph of $f(x) = -3x^2 + 24x$ at the point (3, 45) Sketch this line on your graph for exercise #1 above.**

4. **Show how to evaluate $\int_0^8 (-3x^2 + 24x)\,dx$. On your graph for exercise #1 above, shade in the region whose area is given by the value of the integral of this exercise.**

Some exercises you may do with the aid of a calculator and a 3" x 5" note card. Be sure to carefully explain your reasoning with carefully stated justifications. Also, state your conclusions using complete sentences.

5. **Our text cites a study by Klopzig that notes that a symptom of red pine decline is a large circular area of dead trees (pocket), ringed by trees showing reduced diameter and height growth. The equation y = 0.305 – 0.023x approximates this effect, where y is the proportion of dead roots and x is the distance from the pocket margin. (a) On the margin of the pocket what will be the percent of dead roots of the affected trees? (b) If two trees are both outside the pocket margin, but both within the affected area, and we know one tree is 5 units further from the pocket margin than the other, how will the percent of dead roots in the two trees compare?**

6. **Consider the function f(x) defined by $f(x) = -\frac{1}{3}x^3 + x - 1$. Show how to find the critical values of the function; then show how to determine the intervals on which the function is increasing and the intervals on which the function is decreasing. Identify the exact relative maximum and relative minimum values of the function and identify where those values occur, and finally sketch a graph of the function. Carefully justify your responses and clearly state your conclusions.**

7. **A tank holding 10,000 gallons of a polluting chemical breaks at the bottom and spills out at the rate given by $g'(t) = 400e^{-0.01t}$, where t is in hours. How much of the chemical spills during the first day?**