Lesson 2

Notes

Example 1. Evaluate $\int_{-1}^{2} 12(x^2-2)(x^3-6x)^3 dx$.

Example 2. Compute $\int x^2 \sqrt{2x-5} \, dx$.

Example 3. Compute

$$\int \frac{5x}{\sqrt{x+6}} \, dx.$$

Example 4. The area under the curve

 $y = te^{t^2}$

for t in the interval [0, x] is 2. What is x?

Example 5. Find the average value of the function

$$y = \sqrt{x^2 + 1}x^3$$

for the interval $1 \le x \le 3$.

Example 6. You decide to build a sandcastle in your driveway. Since your driveway is concrete and nowhere near a beach, you purchase a large 100 L bag of sand. Since the bag is very heavy, you choose to drag the bag to carry it up the driveway creating a growing hole that allows sand to escape at a changing rate of

 $s'(t) = 5 - t^2(t^3 + 3)^2$ liters per minute.

How much sand escaped during the time interval between 5 and 30 seconds after the bag ripped?

Example 7. The optimal brewing temperature for coffee is about 200°F. If the coffee doesn't sit on a hotplate, it has been observed that the temperature falls at a rate of

$$T'(t) = -5e^{-.05t}$$
 °F/min.

What is the average temperature of the coffee during the first 15 minutes after being brewed?