

### TI-84+ Lab 3 For Mathematics 224

**Topics:** definite integrals, area and definite integrals, area between two curves

**Definite Integration.** We look at two ways to calculate the definite integral:

$$\int_0^{1.9} (e^x - 5x^2 - 2x + 5) dx$$

- *Using 2nd CALC.*

Type  $e^x - 5x^2 - 2x + 5$  into  $Y_1 =$ .

Use WINDOW  $-2$   $3$   $1$   $-20$   $10$   $2$ .

Press GRAPH, then 2nd CALC 7:  $\int f(x) dx$ , then 0 ENTER for the lower bound, 1.9 ENTER for the upper bound,

The calculator should return approximately 0.14.

- *Using fnInt.*

Type  $e^x - 5x^2 - 2x + 5$  into  $Y=$ .

Type MATH 9:fnInt( $Y_1,X,0,3$ ).

The calculator should return approximately 0.14.

**Area and definite integrals.** Calculate integral and *area* of  $f(x) = 5x$  on  $[-5, 5]$ .

1. To integrate  $f(x) = 5x$ ,  $[-5, 5]$ ,

$$\int_{-5}^5 5x dx = \left[ \frac{5}{2}x \right]_{x=-5}^{x=5} = \frac{5}{2}(5)^2 - \frac{5}{2}(-5)^2 = 0$$

GRAPH 2nd CALC 7:  $\int f(x) dx$  ENTER  $-5$  ENTER  $5$  ENTER  
OR MATH fnInt( $Y_2,X,-5,5$ ) instead

2. If considered area, split into *two* integrals

$$\begin{aligned} \int_{-5}^5 5x dx &= \int_{-5}^0 5x dx + \int_0^5 5x dx \\ &= \left| \left[ \frac{5}{2}x \right]_{x=-5}^{x=0} \right| + \left| \left[ \frac{5}{2}x \right]_{x=0}^{x=5} \right| \\ &= \left| \frac{5}{2}(0)^2 - \frac{5}{2}(-5)^2 \right| + \left| \frac{5}{2}(5)^2 - \frac{5}{2}(0)^2 \right| = 125 \end{aligned}$$

MATH  $-1 \times$  fnInt( $Y_2,X,-5,0$ ) + MATH fnInt( $Y_2,X,0,5$ )

**Area Between Two Curves.** Find area between  $f(x) = 3x + 5$  and  $g(x) = 1 + x^2$  on  $[1,3]$ .

- verify  $f(x) \geq g(x)$  on  $[1,3]$  by graphing both functions, and noticing  $f(x) \geq g(x)$  on  $[1,3]$ .

WINDOW 0 4 1 0 20 1 then  $Y_1 = 3x + 5$ ,  $Y_2 = 1 + x^2$ , GRAPH.

- calculate area between  $f(x)$  and  $g(x)$

$$\begin{aligned} \int_a^b [f(x) - g(x)] dx &= \int_1^3 [(3x + 5) - (1 + x^2)] dx \\ &= \int_1^3 (-x^2 + 3x + 4) dx \\ &= \left( -\frac{1}{2+1}x^{2+1} - 3 \cdot \frac{1}{1+1}x^{1+1} + 4 \cdot \frac{1}{0+1}x^{0+1} \right)_{x=1}^{x=3} \\ &= \left( -\frac{1}{3}x^3 + \frac{3}{2}x^2 + 4x \right)_{x=1}^{x=3} = \frac{34}{3} \end{aligned}$$

MATH ENTER MATH fnInt( $Y_1 - Y_2, X, 1, 3$ ), then MATH ENTER for fraction.