MATH 190, Lab 10: Nov 13 and 15, 2018

Work through the following problems while TAs circulate. When you have completed the problems (to the satisfactory of the facilitators), you can spend the rest of the lab working on the worksheet for Riemann sums posted on Canvas, Modules, week 10.

Part 1. Test Your Understanding: Discuss the following questions in your groups and write a short explanation for each of them.

1. Explain what the geometric meaning of $\int_a^b f(x)dx$ is.

2. Explain why the expression

$$\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\,\Delta x$$

should give exactly the area under the curve $f(x)$, whereas

$$\sum_{i=1}^{n} f(x_i)\,\Delta x$$

should give an approximation to area under the curve $f(x)$.

Part 2. Compute the anti-derivatives and integrals.

1. Find the **general** anti-derivative of the following functions.

   (a) $f(x) = 0$
   (b) $f(x) = -3$
   (c) $f(x) = -3x$
   (d) $f(x) = x^n,\ n \neq 1$
   (e) $f(x) = \dfrac{1}{x}$
   (f) $f(x) = e^x$
   (g) $f(x) = \sin x$
   (h) $f(x) = \cos x$

2. Evaluate the following integrals.

   (a) $\displaystyle\int_0^{\frac{\pi}{6}} (\sin x + 2\cos x + x)\,dx$
   (b) $\displaystyle\int_{-4}^{-2} \frac{x^3 + x^4}{x}\,dx$
   (c) $\displaystyle\int (e^x + \frac{1}{2x} + \frac{\sqrt{x}}{3} + \frac{1}{4})\,dx$