21-120: Differential and Integral Calculus
Recitation #21 Outline: 11/14/24

1. Evaluate each definite integral.

   (a) $\displaystyle\int_1^{18} \sqrt{\frac{3}{z}}\,dz$

   (b) $\displaystyle\int_0^1 (x^e + e^x)\,dx$

   (c) $\displaystyle\int_0^1 (5x - 5^x)\,dx$

   (d) $\displaystyle\int_0^{\pi/4} \frac{1+\cos^2\theta}{\cos^2\theta}\,d\theta$

   (e) $\displaystyle\int_0^{\pi} g(t)\,dt$ where $g(x) = \begin{cases} \sin x & \text{if } 0 \le x < \pi/2, \\ \cos x & \text{if } \pi/2 \le x \le \pi \end{cases}$

2. Identify the roots of the integrand to remove absolute values, then evaluate the integral.

   (a) $\displaystyle\int_{-2}^{3} |x|\,dx$

   (b) $\displaystyle\int_{-4}^{-2} |t^2 - 2t - 3|\,dt$

3. What is wrong with the equations below (if anything)?

   (a) $\displaystyle\int_{-1}^{1} \frac{1}{x}\,dx = \ln|x|\Big|_{x=-1}^{x=1} = 0$

   (b) $\displaystyle\int_0^{\pi} \sec^2 x\,dx = \tan x\Big|_{x=0}^{x=\pi} = 0$