

Math 16B: Short Calculus II
 Spring 2017, Section 1
 Homework Sheet 4
 Due: Monday, May 1, 2017

Submit your solutions to the following problems in lecture on the due date above. Present your work in a clean and organized fashion, either on a printed copy of this document (preferred) or a separate sheet of paper. As stated in the syllabus, late submissions will **not** be accepted.

1. Evaluate the following integrals.

$$(a) \int_0^{\pi} 21 \sin(7x) dx = -3 \cos(7x) \Big|_0^{\pi} = (-3 \cos(7\pi)) - (-3 \cos(0))$$

$$= 3 - (-3) = \boxed{6}$$

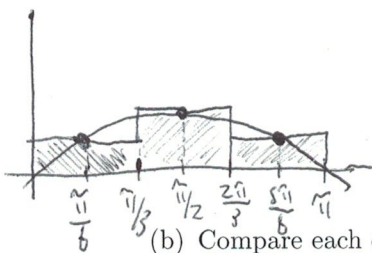
$$(b) \int_{\ln(\pi/2)}^{\ln(\pi)} e^x \cos(e^x) dx = \sin(e^x) \Big|_{\ln(\pi/2)}^{\ln(\pi)} = \sin(e^{\ln(\pi)}) - \sin(e^{\ln(\pi/2)})$$

$$= \sin(\pi) - \sin(\pi/2) = 0 - 1 = \boxed{-1}$$

2. Consider the following integral.

$$\int_0^{\pi} \sin(x) dx$$

(a) Approximate the above integral using a midpoint sum with $n = 3$ subdivisions.



$$\text{Estimate} = \sin\left(\frac{\pi}{6}\right) \cdot \left(\frac{\pi}{3}\right) + \sin\left(\frac{\pi}{2}\right) \cdot \left(\frac{\pi}{3}\right) + \sin\left(\frac{5\pi}{6}\right) \cdot \left(\frac{\pi}{3}\right)$$

$$= \left(\frac{1}{2}\right) \left(\frac{\pi}{3}\right) + (1) \left(\frac{\pi}{3}\right) + \left(\frac{1}{2}\right) \left(\frac{\pi}{3}\right) = \boxed{\frac{2\pi}{3}}$$

(b) Compare each of your estimates to the exact area under the curve.

$$\int_0^{\pi} \sin(x) dx = -\cos(x) \Big|_0^{\pi} = (-\cos(\pi)) - (-\cos(0))$$

$$= 1 - (-1) = 2$$

$$\text{Actual} = 2$$

$$\text{Estimate} = \frac{2\pi}{3} \approx 2.094$$