Dawson College: Calculus II: 201-NYB-05-C1: Winter 2008

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Quiz 3

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §4.2#47 (4 marks)
Use the limit process to find the area of the region between the graph of the function $f(x) = -2x + 3$ and the x-axis over the interval $[0, 1]$:

$$\text{Area} = \lim_{n\to\infty} \sum_{i=1}^{n} f(a + i\Delta x)\Delta x \quad \text{where } \Delta x = \frac{b-a}{n} = \frac{1}{n}$$

$$= \lim_{n\to\infty} \sum_{i=1}^{n} (-2(i\Delta x) + 3)\Delta x$$

$$= \lim_{n\to\infty} \sum_{i=1}^{n} \left(-2\frac{i}{n} + 3\right)\frac{1}{n}$$

$$= \lim_{n\to\infty} \frac{-2}{n^2}\sum_{i=1}^{n} i + \lim_{n\to\infty}\frac{1}{n}\sum_{i=1}^{n} 3$$

$$= \lim_{n\to\infty} \frac{-2}{n^2}\left(\frac{n(n+1)}{2}\right) + \lim_{n\to\infty}\frac{1}{n}3n$$

$$= \lim_{n\to\infty}\left(-\frac{n^2}{n^2} + \frac{n}{n^2}\right) + 3 \quad (\text{the } \tfrac{n}{n^2} \to 0)$$

$$= -1 + 3$$

$$= 2$$

Question 2. §5.7#13 (3 marks)
Integrate the following definite integral:

$$\int_{-1}^{1} (t^3 - 9t)\,dx = \left[\frac{t^4}{4} - \frac{9}{2}t^2\right]\Big|_{-1}^{1}$$

$$= \frac{(1)^4}{4} - \frac{9}{2}(1)^2 - \left[\frac{(-1)^4}{4} - \frac{9(-1)^2}{2}\right]$$

$$= \frac{1}{4} - \frac{9}{2} - \frac{1}{4} + \frac{9}{2} = 0$$

Question 3. §4.3#33,34,35 (3 marks)
Given $\int_2^4 x^3\,dx = 60$ and $\int_2^4 x\,dx = 6$ evaluate the following definite integrals:

1. $$\int_4^2 x\,dx = -\int_2^4 x\,dx = -6$$

2. $$\int_2^2 x^3\,dx = 0$$

3. $$\int_2^4 4x\,dx = 4\int_2^4 x\,dx = 4 \cdot 6 = 24$$