MATH 205 – Calculus I **SQ 5.4**

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To receive any credit for the following problems, you must show complete and accurate work. Use proper limit notation and give exact answers unless otherwise noted.

1. Determine the average value of $f(x) = 6x^2 + 10x - 1$ on the [-1, 3]

$$\frac{1}{3-(-1)}\int_{-1}^{3}(6x^2+10x-1)\,dx$$

$$\frac{1}{4}(2x^3+5x^2-x)\Big|_{-1}^{3}$$

$$\frac{1}{4}\left[(2(3)^3+5(3)^2-3)-(2(-1)^3+5(-1)^2+1)\right]$$

$$\frac{1}{4}\left[(54+45-3)-(-2+5+1)\right]$$

$$\frac{1}{4}[96-4]$$

$$92/4 = 23$$

The average value of the function $6x^2+10x-1$ on the interval $[-1,3]$ is 23.

2. Use symmetry to evaluate $\int_{-4}^{4}(8x^{11} - \sin(x) + 9x^2 + 5)\,dx$

odd odd even even

$$\int_{-4}^{4}8x^{11}\,dx - \int_{-4}^{4}\sin x\,dx + \int_{0}^{4}(9x^2+5)\,dx$$

$$0 - 0 + 2(3x^3+5x)\Big|_{0}^{4}$$

$$2((3(4)^3+5(4)) - (3(0)^3+5(0)))$$

$$2(92+20) - 0$$

$$424$$

3. Determine the point(s) where the average value of $f(x) = \frac{1}{x}$ is equal to $f(x)$ on [1, 4]

$$\frac{1}{4-1}\int_{1}^{4}\frac{1}{x}\,dx$$

$$\frac{1}{3}(\ln|x|)\Big|_{1}^{4}$$

$$\frac{1}{3}[\ln(4)-\ln(1)]$$

$$\frac{\ln 4}{3}$$

$$\frac{1}{x} = \frac{\ln 4}{3}$$

$$3 = x\ln 4$$

$$\frac{3}{\ln 4} = x$$