MATH 113 – QUIZ 12 – 11 DECEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (4 pts. each) Use the Fundamental Theorem of Calculus to evaluate the following definite integrals

(a) $\int_2^4 (x^2 - 25)\,dx$

$= \left(\frac{1}{3}x^3 - 25x\right)\Big|_2^4 = \left(\frac{64}{3} - 100\right) - \left(\frac{8}{3} - 50\right)$

$= \frac{56}{3} - 50 = -\frac{94}{3}$ //

(b) $\int_{\pi/2}^{2\pi} \sin(x)\,dx$

$= -\cos(x)\Big|_{\frac{\pi}{2}}^{2\pi} = -\cos(2\pi) - \left(-\cos\left(\frac{\pi}{2}\right)\right)$

$= -1 + 0 = -1$ //

2. (2 pts. each)

(a) Find the average value of the function $f(x) = x^2 - 25$ on the interval $[2, 4]$.

$f_{av} = \frac{1}{4-2}\int_2^4 (x^2 - 25)\,dx = \frac{1}{2}\left(-\frac{94}{3}\right) = -\frac{47}{3}$ //

(b) Find the average value of the function $f(x) = \sin(x)$ on the interval $[\pi/2, 2\pi]$.

$f_{av} = \frac{1}{2\pi - \frac{\pi}{2}}\int_{\frac{\pi}{2}}^{2\pi} \sin(x)\,dx = \frac{-1}{\frac{3\pi}{2}} = -\frac{2}{3\pi}$

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1. (4 pts. each) Use the Fundamental Theorem of Calculus to evaluate the following definite integrals

(a) $\int_{-1}^{2}(x^3-1)\,dx$

$= \left(\frac{1}{4}x^4 - x\right)\Big|_{-1}^{2} = \left(\frac{1}{4}(16)-2\right) - \left(\frac{1}{4}(1) - (-1)\right)$

$= 4 - 2 - \frac{1}{4} - 1 = \frac{3}{4}$ //

(b) $\int_{0}^{\pi/2}(\cos(x)-1)\,dx$

$= \sin(x) - x \Big|_{0}^{\pi/2} = \left(\sin\left(\frac{\pi}{2}\right) - \frac{\pi}{2}\right) - (\sin(0) - 0)$

$= 1 - \frac{\pi}{2} - 0 = 1 - \frac{\pi}{2}$ //

2. (2 pts. each)

(a) Find the average value of the function $f(x) = x^3 - 1$ on the interval $[-1, 2]$.

$f_{av} = \frac{1}{2-(-1)}\int_{-1}^{2} x^3 + 1\,dx = \frac{1}{3}\cdot\frac{3}{4} = \frac{1}{4}$ //

(b) Find the average value of the function $f(x) = \cos(x) - 1$ on the interval $[0, \pi/2]$.

$f_{av} = \frac{1}{\frac{\pi}{2}-0}\int_{0}^{\pi/2}(\cos x - 1)\,dx = \frac{1-\frac{\pi}{2}}{\frac{\pi}{2}} = \frac{2}{\pi} - 1$ //

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1. (4 pts. each) Use the Fundamental Theorem of Calculus to evaluate the following definite integrals

(a) $\int_0^2 (4 - x^2)\,dx$

$= 4x - \frac{1}{3}x^3 \Big|_0^2 = \left(4(2) - \frac{1}{3}(8)\right) - \left(4(0) - \frac{1}{3}(0)^3\right)$

$= 8 - \frac{8}{3} = \frac{16}{3}$ //

(b) $\int_0^{\pi/2} \sin(2x)\,dx$

$= -\frac{1}{2}\cos(2x) \Big|_0^{\frac{\pi}{2}} = -\frac{1}{2}\left(\cos\pi - \cos(0)\right)$

$= -\frac{1}{2}(-1-1) = 1$ //

2. (2 pts. each)

(a) Find the average value of the function $f(x) = 4 - x^2$ on the interval $[0, 2]$.

$f_{av} = \frac{1}{2-0}\int_0^2 (4-x^2)dx = \frac{1}{2}\cdot\frac{16}{3} = \frac{8}{3}$ //

(b) Find the average value of the function $f(x) = \sin(2x)$ on the interval $[0, \pi/2]$.

$f_{av} = \frac{1}{\frac{\pi}{2}-0}\int_0^{\pi/2} \sin(2x)\,dx = \frac{2}{\pi}\cdot 1 = \frac{2}{\pi}$ //