Key
4 pts each

Elements of Calculus I, MATH 180 Quiz 14

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(1) Evaluate the following:

(a) $\int_0^2 (2x-1)^5 dx$ $= \frac{1}{2}\,2\int_0^2 (2x-1)^5 dx = \frac{1}{2}\int_{-1}^{3} u^5\,du$ +1

+1 $\begin{cases} u = 2x-1 \\ du = 2dx \end{cases}$

+1 $\begin{cases} u(0) = -1 \\ u(2) = 3 \end{cases}$

$= \frac{1}{2}\cdot\frac{1}{6}u^6\Big|_{-1}^{3} = \frac{729}{12} - \frac{1}{12}$ +1

$= \frac{728}{12} = \frac{182}{3}$

(b) $\int_1^3 \frac{2x}{x^2+1} dx$ $= \int_2^{10} \frac{1}{u}\,du = \ln|u|\Big|_2^{10} = \ln 10 - \ln 2$ +1

$= \ln 5$

+1 $\begin{cases} u = x^2+1 \\ du = 2x\,dx \end{cases}$

+1 $\begin{cases} u(1) = 2 \\ u(3) = 10 \end{cases}$

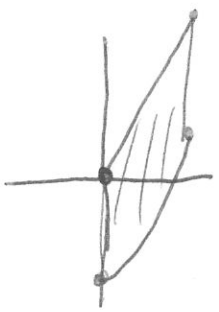
(2) Determine the average value of $f(x) = 4x^3 - 4x$ on the interval $[0, 2]$. +2

$avg = \frac{1}{2-0}\int_0^2 4x^3 - 4x\,dx = \frac{1}{2}(x^4 - 2x^2)\Big|_0^2$ +1

$= \frac{1}{2}(16-8) - 0$ +1

$= 4$

(3) Find the area between the curves $f(x) = 2x$ and $g(x) = x^2 - 3$ on the interval $[0, 2]$.



$+2\int_0^2 2x - (x^2-3)\,dx$

$= \int_0^2 2x - x^2 + 3\,dx = x^2 - \frac{1}{3}x^3 + 3x\Big|_0^2$ +1

$= 4 - \frac{8}{3} + 6 = \frac{22}{3}$ +1