Math 221, Quiz V, November 8, 2000

Answers

I (10 points) (i) $\int (x^2 + 2x^3 + 8x + 10)\, dx$

Answer: $\int (x^2 + 2x^3 + 8x + 10)\, dx = \frac{x^3}{3} + \frac{x^4}{2} + 4x^2 + 10x + C$

(ii) $\int \frac{\tan 4x}{\cos 4x}\, dx$

Answer: First rewrite all in terms of $\sin 4x$ and $\cos 4x$ and then use the substitution $u = \cos 4x$, $du = -4 \sin 4x\ dx$:

$$\int \frac{\tan 4x}{\cos 4x}\, dx = \int \frac{\sin 4x}{\cos^2 4x}\, dx = \frac{-1}{4} \int \frac{1}{u^2}\, dx = \frac{1}{4u} + C = \frac{1}{4\cos 4x} + C$$

(iii) $\int \frac{z+1}{\sqrt[3]{\frac{3}{2}z^2 + 3z + 3}}\, dz$

Answer: Make the substitution $u = \frac{3}{2}z^2 + 3z + 3$, $du = 3z + 3\ dz$, so that $(z+1)\, dz = \frac{1}{3}\, du$:

$$\frac{1}{3} \int \frac{1}{\sqrt[3]{u}}\, dx = \frac{1}{2}u^{2/3} = \frac{1}{2}\left(\frac{3}{2}z^2 + 3z + 3\right)^{2/3} + C$$

II (10 points) Approximate the area under the curve $y = 3x^2$ and bounded by the lines $x = 0$ and $x = 2$ using 4 circumscribed rectangles of equal base length (i.e. width). Note that *circumscribed* means the area of the rectangles should be too big.

Answer: The rectangles each have width $\Delta x = \frac{1}{2}$, and the sum of the areas of the four rectangles is:

$$[f(1/2)\Delta x + f(1)\Delta x + f(3/2)\Delta x + f(2)\Delta x] =$$

$$= \frac{1}{2}[3(1/2)^2 + 3(1)^2 + 3(3/2)^2 + 3(2)^2] = \frac{45}{4}$$

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There are  179 scores
range        count      percent
18... 20      77          43.0%
16... 17      43          24.0%
14... 15      25          14.0%
12... 13      11           6.1%
10... 11       5           2.8%
 8...  9       7           3.9%
 0...  7      11           6.1%
Mean score =  16.0.
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