

AP Calculus AB

Friday, January 11, 2013

Bellwork... Find the antiderivative of each.

$$5) \int (x^3 - 3)^5 \cdot 3x^2 dx$$

$$\text{Let } u = x^3 - 3$$

$$\frac{du}{dx} = 3x^2$$

$$du = 3x^2 dx$$

Substitute.

$$\int u^5 du$$

integrate

$$= \frac{u^6}{6} + C$$

→ substitute

$$\frac{(x^3 - 3)^6}{6} + C$$

$$8) \int 20x^4 \cdot \sec^2(x^5 + 3) dx$$

$$u = x^5 + 3$$

$$\frac{du}{dx} = 5x^4$$

$$du = 5x^4 dx$$

$$\int 4 \cdot 5x^4 \sec^2(x^5 + 3) dx$$

substitute

$$\int 4 \sec^2 u \cdot du$$

$$= 4 \tan u + C$$

$$= 4 \tan(x^5 + 3) + C$$

$$\int 20x^4 \sec^2(x^5+3) dx$$
$$\int 20x^4 [\sec(x^5+3)]^2 dx$$

$$\int \frac{1}{2}x \left(\frac{1}{4}x^2 - 3\right)^5 dx$$

$$\frac{\frac{1}{2}x \left(\frac{1}{4}x^2 - 3\right)^6}{\frac{1}{2}x \cdot 6} + C$$

$$\text{Ex. } \frac{1}{2} \int \sqrt[3]{2x-1} dx$$

$$u = 2x-1$$

$$du = 2dx$$

$$\frac{1}{2} \int u^{1/3} du$$

$$= \frac{1}{2} \cdot \frac{u^{4/3}}{4/3} + C$$

$$= \frac{1}{2} \cdot \frac{3}{4} (2x-1)^{4/3} + C$$

$$= \frac{3(2x-1)^{4/3}}{8} + C$$

Yesterday's Method

$$\int (2x-1)^{1/3} dx$$

$$= \frac{(2x-1)^{4/3}}{2 \cdot 4/3} + C$$

$$= \frac{3(2x-1)^{4/3}}{8} + C$$

$$\frac{1}{4} \int 4 \csc(4x+3) \cot(4x+3) dx$$

$$u = 4x+3$$

$$du = 4dx$$

$$= \frac{1}{4} \int \csc u \cot u du$$

$$= -\frac{1}{4} \csc u + C$$

$$= -\frac{1}{4} \csc(4x+3) + C$$

$$\text{Ex. } \int 3 \sin(1-3x) dx$$

$$\text{Let } u = 1-3x$$

$$\frac{du}{dx} = -3$$

$$du = -3 dx$$

Rewrite problem

$$-1 \int [\sin(1-3x)] \cdot 3 dx$$

substitute

$$-1 \int [\sin u] du$$

$$= -1 \cdot -\cos u + C$$

$$= \cos u + C$$

$$= \cos(1-3x) + C$$

check by finding derivative:

$$f(x) = \cos(1-3x) + C$$

$$f'(x) = -3(-\sin(1-3x))$$

$$f'(x) = 3 \sin(1-3x)$$

$$\text{Ex. } \int (x+2)\sqrt{x-4} dx$$

u-Substitution - Homework

1. $\int \sqrt{x-2} \, dx$

2. $\int (2x+3)^{11} \, dx$

3. $\int \sqrt{5x-1} \, dx$

4. $\int \sqrt[3]{6x+1} \, dx$

5. $\int 5(3-4x)^{2/3} \, dx$

6. $\int \frac{dx}{(8x-1)^3}$

7. $\int x(x^2+2)^6 \, dx$

8. $\int 6x^2 \sqrt{3x^3-1} \, dx$

$$9. \int \left(1 + \frac{1}{x}\right)^3 \left(\frac{1}{x^2}\right) dx$$

$$10. \int x^{1/3} \left(x^{4/3} + 9\right)^8 dx$$

$$11. \frac{2}{3} \int \sqrt{4 - \frac{3}{5}x} dx$$

$$12. \int (3x+15)\sqrt{x^2+10x+4} dx$$

$$13. \int (x+2)\sqrt{x-2} \, dx$$

$$14. \int \frac{x^2}{\sqrt{x-4}} \, dx$$

$$15. \int \sin 5x \, dx$$

$$16. \int \cos \frac{x}{2} \, dx$$

$$17. \int \frac{1}{3} \sec^2 8x \, dx$$

$$18. \int \sin 4x \cos 4x \, dx$$

19. $\int \cos^3 x \sin x \, dx$

20. $\int \tan x \sec^2 x \, dx$

21. $\int \sqrt{\cos 6x} \sin 6x \, dx$

22. $\int \frac{\sin x}{(4 - \cos x)^3} \, dx$