10.2 *u* Substitution Indefinite Integrals

NOTES

CALCULUS

Write your questions here!

Evaluate the indefinite integrals using *u* substitution.

$\int (3x-4)^5 dx$

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

$\int \sqrt{4x-5}\, dx$

$\int \frac{(\sqrt{x}-1)^2}{\sqrt{x}} dx$

u substitution

Because chain rule…

$$\frac{d}{dx} g(f(x)) = g'(f(x))f'(x)$$

Then anti chain rule…

$$\int g'(f(x))f'(x)dx = g(f(x)) + c$$

Get triggy with it

$\int \sin x\, e^{\cos x}\, dx$

$\int \cos(2x+1)\, dx$

$\int \cot(3x)\, dx$

Simplify versus *u* substitution

$$\int \frac{e^x}{3+e^x}\,dx$$

$$\int (e^x+3)\,dx$$

$$\int \frac{\ln(e^{2x})}{x^2}\,dx$$

Trig Identities

Pythagorean

$$\sin^2 x + \cos^2 x = 1$$
$$\sin^2 x = 1 - \cos^2 x$$
$$\cos^2 x = 1 - \sin^2 x$$

$$1 + \cot^2 x = \csc^2 x$$

$$\tan^2 x + 1 = \sec^2 x$$

Double Angle

$$\sin(2x) = 2\sin x \cos x$$

$$\cos(2x) = \cos^2 x - \sin^2 x$$
$$= 1 - 2\sin^2 x$$
$$= 2\cos^2 x - 1$$

Example:

$$\int \cos^3 x\,dx$$

SUMMARY:

Now, summarize your notes here!

10.2 *u* Substitution Indefinite Integrals

PRACTICE

Find the indefinite integral.

1. $\int 5x\sqrt[3]{1-x^2}\,dx$

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

3. $\int \sin(2t)\,dt$

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

5. $\int \frac{\cos\sqrt{x}}{\sqrt{x}}\,dx$

6. $\int xe^{x^2}dx$

7. $\int \frac{\sin x}{1+\cos^2 x}\,dx$

8. $\int \frac{x^2+x}{x}\,dx$

9. $\int 3\sec^2(3\theta)d\theta$

10. $\int e^x \sin e^x dx$

11. $\int \tan x \cos x \, dx$

12. $\int \frac{\sec^2 x}{\sqrt{\tan x}} dx$

13. $\int \sqrt[3]{x}(x^2+1)dx$

14. $\int \frac{xdx}{\sqrt{1-x^2}}$

15. $\int r(r^2+1)^{\frac{3}{2}} dr$

16. $\int \frac{(\ln x)^5}{x} dx$

17. $\int (2x+5)(x^2+5x)^7 dx$

18. $\int \frac{e^x}{4-e^x} dx$

MULTIPLE CHOICE

1. $\int x\sin x^2 dx =$

(A) $-\frac{1}{2}\cos x^2 + C$

(B) $\frac{1}{2}\cos x^2 + C$

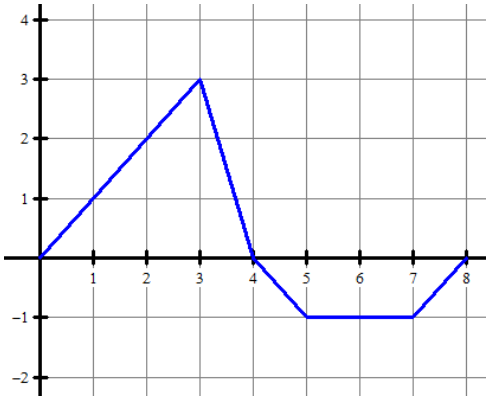
(C) $-x^2 \cos x^2 + C$

(D) $x^2 \cos x^2 + C$

(E) $\frac{1}{2}x^2\cos \frac{x^2}{3} + C$

Questions 2-3 refer to the following situation.

A spider begins to crawl up a vertical blade of grass at time $t = 0$. The velocity *v* of the spider at time *t*, $0 \le t \le 8$, is given by the function whose graph is shown below.



2. At what value of *t* does the spider change direction?

(A) 3

(B) 4

(C) 5

(D) 7

(E) 8

3. What is the total distance travelled by the spider from $t = 0$ to $t = 8$?

(A) 3

(B) 8

(C) 9

(D) 10

(E) 15

4. $\frac{1}{3}\int e^{t/3}dt =$

(A) $e^t + C$

(B) $3e^{t/3} + C$

(C) $e^{t/3} + C$

(D) $\frac{1}{3}e^{t/3} + C$

(E) $e^{-2/3t} + C$

5. The acceleration of a particle moving along the *x*-axis is by $a(t) = 4t - 12$. If the velocity is 10 when $t = 0$ and the position is 4 when $t = 0$, then the particle is changing direction at

(A) $t = 1$

(B) $t = 3$

(C) $t = 5$

(D) $t = 1$ and $t = 5$

(E) $t = 1$ and $t = 3$ and $t = 5$

6. $\int \sin^5(2x)\cos(2x)dx =$

(A) $\frac{\sin^6(2x)}{12} + C$

(B) $\frac{\sin^6(2x)}{6} + C$

(C) $\frac{\sin^6(2x)}{3} + C$

(D) $\frac{\cos^5(2x)}{3} + C$

(E) $\frac{\cos^5(2x)}{6} + C$

7. $\lim_{h\to 0} \frac{\tan\left(\frac{\pi}{6} + h\right) - \tan\left(\frac{\pi}{6}\right)}{h} =$

(A) $\frac{\sqrt{3}}{3}$

(B) $\frac{4}{3}$

(C) $\sqrt{3}$

(D) 0

(E) $\frac{3}{4}$