

Write your questions  
and thoughts here!

Remember the Chain Rule? We have something similar when we take antiderivatives. It is called \_\_\_\_\_. Look at the integrand and think about taking the derivative. If the derivative requires the chain rule, then the antiderivative will require u-substitution.

### Indefinite Integrals and u-Substitution.

**Find the indefinite integral.**

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

2.  $\int 6x^2(x^3 + 4)^5 dx$

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

4.  $\int \sin x e^{\cos x} dx$

5.  $\int \cot(3x) dx$

Some tricky examples

**U-sub is used, but you must solve for  $x$ .**

6.  $\int \frac{x}{\sqrt{x+1}} dx$

**Inverse trig can be confused with u-sub.**

7.  $\int \frac{1}{\sqrt{1-4x^2}} dx$

Write your questions  
and thoughts here!

## Definite Integrals and u-Substitution.

Evaluate the definite integral.

8.  $\int_0^2 t^2 \sqrt{t^3 + 1} dt$

9.  $\int_0^{\frac{\pi}{2}} \cos(x) \sqrt{\sin(x)} dx$

### 6.9 Integrating Using Substitution

Calculus

**Practice**

Find the indefinite integrals.

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

2.  $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$

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

4.  $\int \frac{1}{\sqrt{1-9x^2}} dx$

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

6.  $\int \tan x \cos x dx$

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

8.  $\int \frac{x dx}{\sqrt{1-x^2}}$

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

10.  $\int \frac{1}{25x^2+1} dx$

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

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

**Evaluate the definite integrals.**

13.  $\int_0^{\frac{\pi}{2}} \sin(2x) dx$

14.  $\int_{-\frac{1}{3}}^{\frac{1}{3}} \frac{1}{1+9t^2} dt$

15.  $\int_0^4 \frac{1}{\sqrt{2x+1}} dx$

$$16. \int_{-\frac{\pi}{4}}^0 \tan x \sec^2 x \, dx$$

$$17. \int_0^{\frac{\pi}{8}} \sec(2x) \tan(2x) \, dx$$

$$18. \int_1^e \frac{\ln x}{x} \, dx$$

$$19. \int_0^1 \frac{x^2+2x}{\sqrt[3]{x^3+3x^2+4}} \, dx$$

$$20. \int_0^{\pi} (2 \sin x + \sin 2x) \, dx$$

## 6.9 Integrating Using Substitution

**Test Prep**

21. If  $\int_0^k \frac{x}{x^2+6} \, dx = \frac{1}{2} \ln 6$ , where  $k > 0$ , then  $k =$

(A)  $\sqrt{6}$

(B)  $\sqrt{30}$

(C)  $\ln 6$

(D)  $\frac{1}{2} \tan^{-1}(x)$

(E)  $\frac{1}{2} \tan x$

22. The function  $f$  is continuous and  $\int_4^{19} f(u) du = 10$ . What is the value of  $\int_1^4 [x \cdot f(x^2 + 3)] dx$

(A)  $\frac{5}{2}$

(B) 5

(C) 10

(D) 20

(E) 40

---

23.  $\int \frac{1}{\sqrt{16-x^2}} dx$

(A)  $\ln(\sqrt{16-x^2}) + C$

(B)  $\ln \frac{(\sqrt{16-x^2})}{-2x} + C$

(C)  $\frac{1}{4} \sin^{-1} \left( \frac{x}{4} \right) + C$

(D)  $4 \sin^{-1} \left( \frac{x}{4} \right) + C$

(E)  $\sin^{-1} \left( \frac{x}{4} \right) + C$