10.3 u Substitution Definite Integrals

NOTES

CALCULUS

Write your questions here!

Evaluate the indefinite integrals using *u* substitution.

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

INVERSE TRIG

$\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1}x + C$	$\int \frac{-dx}{\lvert x\rvert\sqrt{x^2-1}} = \csc^{-1}x + C$
$\int \frac{-dx}{\sqrt{1-x^2}} = \cos^{-1}x + C$	$\int \frac{dx}{\lvert x\rvert\sqrt{x^2-1}} = \sec^{-1}x + C$
$\int \frac{dx}{1+x^2} = \tan^{-1}x + C$	$\int \frac{-dx}{1+x^2} = \cot^{-1}x + C$

Evaluate the indefinite integrals using *u* substitution.

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

DEFINITE INTEGRAL

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

Evaluate the definite integrals using *u* substitution.

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

$$\int_0^{e} \frac{x}{x^2+4}\,dx$$

SUMMARY:

Now, summarize your notes here!

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PRACTICE

Evaluate the definite integral.

1. $\int_0^1 \frac{x}{(x^2+1)^3}\,dx$

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

3. $\int_0^3 2x\sqrt{3x-5}\;dx$

4. $\int_1^{10} \sqrt{5x-1}\;dx$

Evaluate the definite integral.

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

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6. $\int_{1}^{5} x\sqrt{2x-1}\,dx$

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7. $\int_{3}^{6} (x^2 - 2x)\,dx$

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8. $\int_{1}^{3} \frac{8x}{\sqrt{1-16x^2}}\,dx$

Evaluate the definite integral.

9. $\int_{\sqrt{\frac{\pi}{8}}}^{\sqrt{\frac{\pi}{4}}} \frac{-x\csc^2(2x^2)}{\cot(2x^2)}\,dx$

10. $\int_0^1 \frac{y^2+2y}{\sqrt[3]{y^3+3y^2+4}}\,dy$

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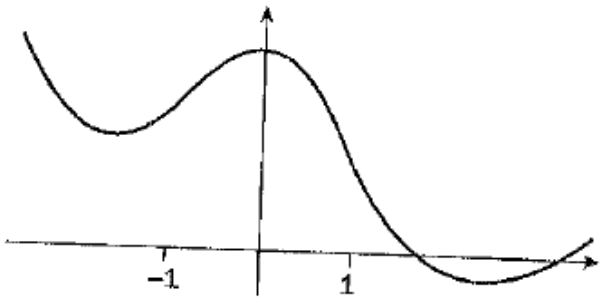
TEST PREP

MULTIPLE CHOICE

5. The cost of producing x units of a certain item is $c(x) = 2000 + 8.6x + 0.5x^2$. What is the instantaneous rate of change of c with respect to x when $x = 300$?

(A) 313.6
(B) 308.6
(C) 300.0
(D) 297.2
(E) 200.0

12. The graph of $y = f(x)$ is given below.



Which of the following is true?

(A) The graph is concave down (for all values of x).

(B) The graph is concave up (for all values of x).

(C) The graph is concave up for $x > 1$ and concave down for $-1 < x < 1$.

(D) The graph is concave up for $-1 < x < 1$ and concave down for $x < -1$.

(E) Nothing can be said about the concavity of the graph above without knowing the rule for the function.

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9. Evaluate $\int_{-1}^{2} (3x^2 - 4x + 2)\,dx$.

(A) –2

(B) 14

(C) 9

(D) 18

(E) 21

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13. Let $f(x) = \pi\sec^2 \pi x - 1$. Which of the following statements is true?

(A) An antiderivative of f is $F(x) = \tan\pi x$ and $\int_{1}^{3} f(x)\,dx = -2$.

(B) An antiderivative of f is $F(x) = \tan\pi x$ and $\int_{1}^{3} f(x)\,dx$ is undefined.

(C) An antiderivative of f is $F(x) = \tan\pi x + 3$ and $\int_{1}^{3} f(x)\,dx = -2$.

(D) An antiderivative of f is $F(x) = \tan\pi x - x$ and $\int_{1}^{3} f(x)\,dx = -2$.

(E) An antiderivative of f is $F(x) = \tan\pi x - x + 3$ and $\int_{1}^{3} f(x)\,dx$ is undefined.

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14. An equivalent representation of the definite integral $\int_1^3 2\cos(x^2)dx$ is

(A) $\int_1^3 \cos u\ du$

(B) $\int_1^9 \cos u\ du$

(C) $\int_1^{\sqrt{3}} \cos u\ du$

(D) $\int_1^9 2\sqrt{u}\cos u\ du$

(A) $\int_1^{\sqrt{3}} 2\sqrt{u}\cos u\ du$

5. B

12. C

9. C

13. E

14. B