Today's Plan:

Learning Target (standard): I will evaluate indefinite integrals using substitution and/or change of variable.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Definite Integrals Practice #1-12

1) $\frac{4}{3}$

2) 20

3) -6

4) $-\frac{45}{4}$

5) 0

6) $-15\sqrt[3]{5}$

7) $-\frac{3}{5}$

8) $-\frac{129}{10}$

9) $-\frac{33}{5}$

10) $\frac{63}{200}$

11) $-\frac{27}{4}$

12) $-\frac{104}{15}$

Evaluate.

$$\int_1^3 \frac{2x^3-4x^2+5}{x^2}\,dx = \int_1^3 x^{-2}(2x^3-4x^2+5)\,dx$$

$$= \int_1^3 (2x-4+5x^{-2})\,dx$$

$$= (x^2-4x-5x^{-1})\Big|_1^3$$

$$= \left[(3)^2-4(3)-\tfrac{5}{3}\right]-\left[(1)^2-4(1)-\tfrac{5}{1}\right]$$

$$= \left(9-12-\tfrac{5}{3}\right)-(1-4-5)$$

$$= -3-\tfrac{5}{3}+8$$

$$= 5-\tfrac{5}{3}$$

$$= \tfrac{10}{3}$$

Evaluate.

$$\int_1^2 \frac{4x^2-5}{x^2}\,dx = \int_1^2 x^{-2}(4x^2-5)\,dx$$

$$= \int_1^2 (4-5x^{-2})\,dx$$

$$= (4x+5x^{-1})\Big|_1^2$$

$$= \left[4(2)+\tfrac{5}{2}\right]-\left[4(1)+\tfrac{5}{1}\right]$$

$$= 8+\tfrac{5}{2}-9$$

$$= -1+\tfrac{5}{2}$$

$$= \tfrac{3}{2}$$

Find the anitderivative.

$$f(x)=\frac{1}{2}x^4-5\sqrt{x}+2$$

$$f(x)=\frac{1}{2}x^4-5x^{\frac{1}{2}}+2$$

$$F(x)=\frac{1}{10}x^5-\frac{10}{3}x^{\frac{3}{2}}+2x+C$$

$$F(x)=\frac{1}{10}x^5-\frac{10}{3}\sqrt{x^3}+2x+C$$

Indefinite Integral:

$$\int\left(\frac{1}{2}x^4-5\sqrt{x}+2\right)dx=\frac{1}{10}x^5-\frac{10}{3}\sqrt{x^3}+2x+C$$

Integration by Substitution/Change of Variable:

- based on derivatives that were found using rules other than the power rule
- choose a part of the integral so that when the derivative is taken, it will resemble the part left over in the integral
- name the part chosen *u* and its derivative *du*

$$f(x)=\left(x^3+2x\right)^{10}$$

$$f'(x)=10(x^3+2x)^9(3x^2+2)$$

$$\int 10\left(x^3+2x\right)^9\left(3x^2+2\right)dx$$

$$=(x^3+2x)^{10}+C$$

Find the integral.

$$\int 10\underbrace{(x^3+2x)}_{u}^9 \underbrace{(3x^2+2)\,dx}_{du}$$

$u = x^3 + 2x$

$du = (3x^2+2)dx$

$\Rightarrow \int 10u^9\,du$

$= u^{10} + C$

$\Rightarrow (x^3+2x)^{10} + C$

Find the integral.

$$\int \frac{x}{\sqrt{x^2+5}}\,dx$$

$\frac{1}{2}du$ u

$u = x^2 + 5$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$\Rightarrow \int \frac{\frac{1}{2}du}{\sqrt{u}}$

$= \frac{1}{2}\int u^{-\frac{1}{2}}du$

$= \frac{1}{2}\left(2u^{\frac{1}{2}}\right) + C$

$= u^{\frac{1}{2}} + C$

$\Rightarrow (x^2+5)^{\frac{1}{2}} + C$

$= \sqrt{x^2+5} + C$

Find the integral.

$$\int (\underbrace{2x^3+1}_{u})^7 \, \underbrace{x^2 dx}_{\frac{1}{6}du}$$

$u = 2x^3 + 1$

$du = 6x^2 \, dx$

$\frac{1}{6} du = x^2 dx$

$\Rightarrow \frac{1}{6}\int u^7 \, du$

$= \frac{1}{6}\left(\frac{1}{8}u^8\right) + C$

$= \frac{1}{48}u^8 + C$

$\Rightarrow \frac{1}{48}(2x^3+1)^8 + C$

Find the integral.

$$\int x\sqrt[3]{7-6x^2}\,dx$$

$u = 7 - 6x^2$

$du = -12x \, dx$

$-\frac{1}{12} du = x \, dx$

$\Rightarrow -\frac{1}{12}\int u^{\frac{1}{3}} du$

$= -\frac{1}{12}\left(\frac{3}{4}u^{\frac{4}{3}}\right) + C$

$= -\frac{1}{16}u^{\frac{4}{3}} + C$

$\Rightarrow -\frac{1}{16}\sqrt[3]{(7-6x^2)^4} + C$

Assignment:

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