Today's Plan:

Learning Target (standard): I will find the average value of a function and describe its meaning.

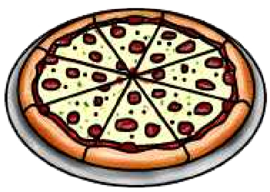
Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

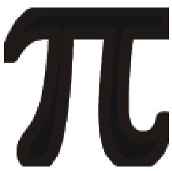
Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

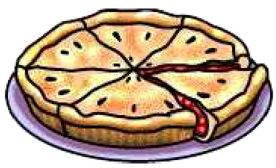
Assessment: Board work, homework check and homework assignment

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.

Happy Pi Day (3.14)!







The ratio of the sun's circumference to its diameter is the π in the sky!

Integration by Substitution Practice #1-12

1) $\frac{2}{7}\left(5x^4+3\right)^{\frac{7}{2}}+C$

2) $\frac{2}{3}\sqrt{\left(3x^5+5\right)^3}+C$

3) $-\frac{1}{2\left(5x^2+3\right)^2}+C$

4) $\frac{3}{4}\sqrt[3]{\left(2x^3-3\right)^4}+C$

5) $\frac{4}{5}\left(3x^5+2\right)^5+C$

6) $\left(3x^4-1\right)^5+C$

7) $\frac{9}{4}\left(2x^3-3\right)^{\frac{4}{3}}+C$

8) $\frac{25}{7}\left(3x^4-2\right)^{\frac{7}{5}}+C$

9) $-\frac{8}{3}$

10) $\frac{1}{2}$

11) $\frac{2}{5}$

12) $\frac{4}{9}$

Evaluate.

$$\int_0^1 (2x-3)(5x+1)\,dx$$

$$= \int_0^1 \left(10x^2-13x-3\right)dx$$

$$= \left(\frac{10}{3}x^3-\frac{13}{2}x^2-3x\right)\Big|_0^1$$

$$= \left(\frac{10}{3}-\frac{13}{2}-3\right)-0$$

$$= \frac{20-39-18}{6}$$

$$= -\frac{37}{6}$$

Evaluate.

$$\int_1^4 \left(5x - 2\sqrt{x} + \frac{32}{x^3}\right) dx$$

$= \int_1^4 \left(5x - 2x^{\frac{1}{2}} + 32x^{-3}\right) dx$

$= \left(\frac{5}{2}x^2 - \frac{4}{3}x^{\frac{3}{2}} - 16x^{-2}\right)\Big|_1^4$

$= \left[\frac{5}{2}(4)^2 - \frac{4}{3}(4)^{\frac{3}{2}} - 16\left(\frac{1}{16}\right)\right] - \left[\frac{5}{2} - \frac{4}{3} - 16\right]$

$= \left(40 - \frac{32}{3} - 1\right) - \left(\frac{15}{6} - \frac{8}{6} - 16\right)$

$= 39 - \frac{32}{3} - \frac{7}{6} + 16$

$= 55 - \frac{(64+7)}{6}$

$= 55 - \frac{71}{6}$

$= \frac{330 - 71}{6}$

$= \frac{259}{6}$

Evaluate.

$$\int_{-1}^{0} (2x+3)^2 \, dx$$

$u = 2x+3$

$du = 2\,dx$

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

$x = 0$
$u = 3$

$x = -1$
$u = 1$

$\Rightarrow \frac{1}{2}\int_1^3 u^2 du$

$= \frac{1}{2}\left(\frac{1}{3}u^3\right)\Big|_1^3$

$= \frac{1}{6}\left(3^3 - 1^3\right)$

$= \frac{1}{6}(26)$

$= \frac{13}{3}$

Evaluate.

$$\int_4^9 \frac{x-3}{\sqrt{x}}\,dx = \int_4^9 (x-3)x^{-\frac{1}{2}}\,dx$$

$$= \int_4^9 \left(x^{\frac{1}{2}} - 3x^{-\frac{1}{2}}\right)dx$$

$$= \left(\frac{2}{3}x^{\frac{3}{2}} - 6x^{\frac{1}{2}}\right)\Big|_4^9$$

$$= \left[\frac{2}{3}(9)^{\frac{3}{2}} - 6(9)^{\frac{1}{2}}\right] - \left[\frac{2}{3}(4)^{\frac{3}{2}} - 6(4)^{\frac{1}{2}}\right]$$

$$= (18-18) - \left(\frac{16}{3} - 12\right)$$

$$= 0 - \frac{16}{3} + 12$$

$$= \frac{20}{3}$$

The Mean Value Theorem

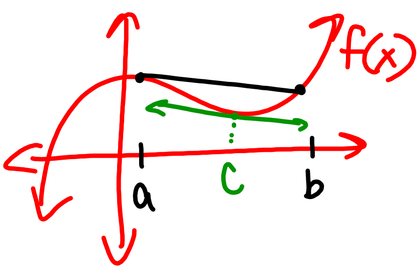
If f(x) is continuous on [a,b] and differentiable on (a,b), then there is a number x = c between a and b for which

$$\underbrace{f'(c)}_{m_{tangent}} = \underbrace{\frac{f(b)-f(a)}{b-a}}_{m_{secant}}$$

instantaneous rate of change "average rate of change"

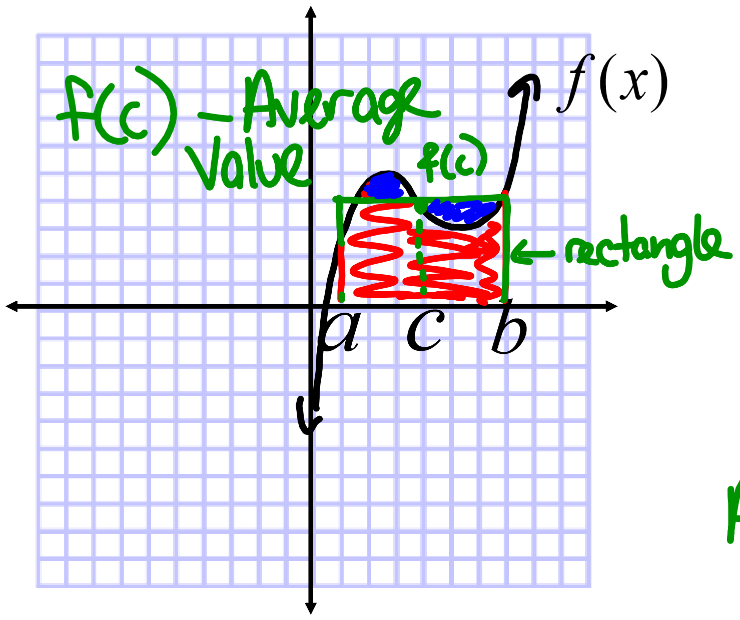
This is usually written as

f(b) –f(a) = (f ′ (c))(b –a).



Mean Value Theorem for Integrals:

"Average Value"



Area under f(x) on [a,b]

$\int_a^b f(x)\,dx$

$a < c < b$

Area Rectangle: bh

$A = (b-a)f(c)$

Average Value of a Function:

The area under the function *f(x)* on [a,b] will be the same as the area of the rectangle that has as its base length (b-a) and its height *f(c)* where a < c < b.

Mean Value Theorem for Integrals:

"Average Value"

If *f(x)* is continuous on a closed interval [a,b], then at some point *c* in the interval [a,b]

$$\boxed{\int_a^b f(x)dx} = \boxed{f(c)(b-a)}$$

Area under *f(x)* on [a,b] = Area of the rectangle

- the area under the curve *f(x)* on [a,b] is equal to the value of the function at some *c* (between a and b) times the length of the interval
- the average height of a rectangle on the interval [a,b] is *f(c)*

$$\frac{1}{b-a}\int_a^b f(x)dx = \boxed{f(c)}$$ Average Value

Assignment:

Integration Practice (non-transcendental)

#1-10