Unit #2: Methods of Integration
Topic: A Different Kind of U-Substitution
Objective: SWBAT evaluate an integral using a u-substitution when a derivative isn't present.

Warm Up #5:

If you were being asked to evaluate $\int \frac{xdx}{\sqrt{1-x^4}}$, explain, in your own words, why $u \neq 1 - x^4$.

What would u need to be and why?

Sometimes we may need to integrate an expression using a substitution where the derivative is not present. This requires us to make a different kind of u-substitution.

Example #1: Find $\int x\sqrt{2x+1}\,dx$

Example #2: Find $\int_4^7 \frac{2x+5}{\sqrt{x-3}}\,dx$

Problem Set #5: Integrate each of the following.

1) $\int x(x+1)^8\,dx$	2) $\int x\sqrt{x+9}\,dx$

3) $\int \frac{x}{\sqrt[4]{x+2}}\, dx$	4) $\int_3^8 \frac{x-1}{\sqrt{x+1}}\, dx$
5) $\int x(2x+1)^4\, dx$	6) $\int_0^3 \frac{x}{\sqrt{x+1}}\, dx$
7) $\int_3^6 x\sqrt{x-2}\, dx$	8) $\int \frac{x}{\sqrt{4x+1}}\, dx$

9) $\int x^2\sqrt{3-x}\ dx$	10) $\int x\sqrt[3]{x+4}\ dx$
11) $\int (x+1)^2\sqrt{x-2}\ dx$	12) $\int_0^1 x^3\sqrt{1-x}\,dx$

Answer Key:

1) $\frac{1}{10}(x+1)^{10}-\frac{1}{9}(x+1)^9+C$	2) $\frac{2}{5}(x+9)^{5/2}-6(x+9)^{3/2}+C$
3) $\frac{4}{7}(x+2)^{7/4}-\frac{8}{3}(x+2)^{3/4}+C$	4) $\frac{26}{3}$
5) $\frac{1}{24}(2x+1)^6-\frac{1}{20}(2x+1)^5+C$	6) $\frac{8}{3}$
7) $\frac{326}{15}$	8) $\frac{1}{24}(4x+1)^{3/2}-\frac{1}{8}(4x+1)^{1/2}+C$
9) $-6(3-x)^{3/2}+\frac{12}{5}(3-x)^{5/2}-\frac{2}{7}(3-x)^{7/2}+C$	
10) $\frac{2}{9}(x+4)^{9/2}-\frac{24}{7}(x+4)^{7/2}+\frac{96}{5}(x+4)^{5/2}-\frac{128}{3}(x+4)^{3/2}+C$	
11) $\frac{2}{7}(x-2)^{7/2}+\frac{12}{5}(x-2)^{5/2}+6(x-2)^{3/2}+C$	12) $\frac{32}{315}$