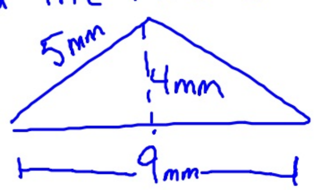
Warm Up   Recall $\sum_{i=2}^{4}(2i+1) = (2(2)+1) + (2(3)+1) + (2(4)+1)$

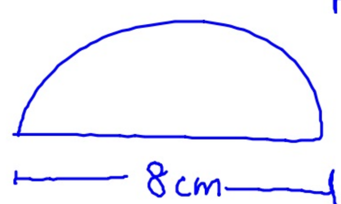
Write as a sum of terms

1. $\sum_{k=2}^{6}(3k-2) = [3(2)-2] + [3(3)-2] + [3(4)-2] + [3(5)-2] + [3(6)-2] = 50$

2. $\sum_{i=1}^{5}\left[(i)^2 g(x_i)\right] = (1)^2 g(x_1) + (2)^2 g(x_2) + (3)^2 (g(x_3)) +$

Find the Area

3. 

4. 

$A = \frac{\pi r^2}{2}$ or $\frac{1}{2}\pi r^2$

$A = \frac{\pi (4)^2}{2} = 8\pi$

Find the Volume

5. 

$V = 160\pi \text{ cm}^3$

6. 

$V = 42\pi \text{ ft}^3$

We know that, given the formula for distance for an object, we can differentiate once and find velocity, then again to find acceleration.

But what if....

we know velocity $v(t) = 2t+1$ and we want distance?

we could guess $d(t) = t^2 + t \overset{252}{\cancel{+1000}}$

This is <u>one</u> possible function

why is it only <u>one</u>?

$$\begin{tikzcd} \underset{F}{t^2+t+C} \arrow[rr, bend left, "\text{differentiation}"] & & \underset{F'=f(x)}{2t+1} \arrow[ll, bend left, "\text{integration}"] \end{tikzcd}$$

The function $s(t) = t^2 + t$ is called an antiderivative of $v(t) = 2t+1$. The process of finding an antiderivative is called <u>integration</u>.

9.1 Antiderivatives and the indefinite integral

<u>def</u> A function F is called an antiderivative of f if $F'(x) = f(x)$.

Power Rule for Antiderivatives

if $f(x) = ax^n$ then the shmoo is

$a, n \in \mathbb{R}$ $\qquad \frac{1}{n+1} a x^{n+1} + C, \; C \in \mathbb{R}$

Ex) $2t^1 + 1$

$\frac{1}{2} 2 t^{1+1} + \frac{1}{1} 1t^1$

$t^2 + t$

Ex) Find the shmoo

a) x^{10}

$\frac{1}{11} x^{10+1}$

$\frac{1}{11}x^{11} + C$

b) $\frac{1}{x^5} = x^{-5}$

$\frac{1}{-4} x^{-5+1}$

$-\frac{1}{4}x^{-4}$

$\frac{-1}{4x^4} + C$

c) $\sqrt[4]{x^3}$

$x^{\frac{3}{4}}$

$\frac{4}{7} x^{\frac{3}{4}+\frac{4}{4}}$

$\frac{4}{7}x^{\frac{7}{4}} + C$

Hw 8A p. 293 #1-12