Antiderivatives

Outcomes: Find the antiderivatives of functions.

Part A – Polynomial Functions:

Review: Find the derivative of

a) $y = x^2$ b) $y = x^2 + 3$ c) $y = x^2 - 7$

Investigate: If $f'(x) = 3x^2$, what is $f(x)$.

- **The original function from which the derivative was obtained is termed the antiderivative, the integral or the primitive.**
- **Anti-differentiation is the inverse operation of differentiation.**
- **Like the derivative the antiderivative may be represented in various ways.**

  If $y = f'(x)$ is the derived function then $y = F(x)$ is the antiderivative.

  Remember that any function in the form $y = F(x) + C$ will have the same derivative.

  $$\frac{d}{dx}(F(x) + C) = f(x)$$

  The antiderivative, or integral, is commonly represented by the following:

  $\int f(x)dx$ 'read - the integral of $f(x)$ with respect to x'

  $$\int 3x^2 = x^3 + C$$

  So doing an antiderivative is like doing a derivative backward.

  - Derivatives, we reduce by a degree and multiply.
  - Antiderivatives we

1. Find the general antiderivative of $f(x) = 1$ or $f = x^0$

2. Find the indefinite integral when $F(x) = \int x dx$

3. Find the general antiderivative of $f(x) = 2x + 3$

4. Find the (most general) antiderivative of $f(x) = 4x^3 - 6x^2 + 11$

5. Integrate $F(x) = \int x^2 dx$

6. Find the general primitive of $f(x) = x^3$

7. Find the antiderivative of $f(x) = \sqrt{x}$

Part B – TRIGONOMETRY:

1. Find the antiderivative of each of the following

a) $f(x) = \sin x$

b) $f(x) = \sin(3x)$

c) $f(x) = cosx$

d) $f(x) = cos(5x)$

2. Find the antiderivative of on the interval

$f(x) = \cos x - \sin x$

3. Find the most general antiderivative of $f(x) = \sin x \cos x$

Part C – EXPONENTS AND LOGARITHM:

1. Find the antiderivative of *f(x),* $f(x) = -3e^{-x} + 6e^{2x}$

2. Find the antiderivative of *f(x)* on the interval $(0, \infty)$

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

Complete the following table

Function: $f(x) =$	**Particular most general antiderivative**
0	
1	
x^n	
$\frac{1}{x}$	
e^{kx}	
$\cos kx$	
$\sin kx$	

Homework: Pg 408 #1 2a, 2b, 3b, 3c, 3d, 4, 6a, 8bc