## **Using the Limit Definition to find the Derivative**

## **The Process:**

1. Identify
2. Substitute and find
3. Substitute these into the limit definition (difference quotient)
4. Simplify
5. Substitute h= 0 into the remaining pieces and simplify
6. The result is the derivative of your function.

**Quadratic Example:**

***Using the definition- difference quotient:***

 substitute and simplify.

***Reduce the fraction before applying limit***

**A*pply the limit***

**Sympolic Example:**

where f(x) is differential.

**Example:**

***Using the definition- limit of the difference quotient:***

 substitute and simplify.

|  |
| --- |
|  ***Distribute and group like terms*** |
| ***Distribute and group like terms*.** |
|  |

 ***Note****: only terms with an h should remain.*

***Reduce the fraction before applying the limit.***

***Apply the limit***

 =

Thus**,**

**Trigonometry Example**

 by definition

**To simplify this one, we need to remember a few more formulas from the trig identities.**

**= 1**

**Applying the sum formula, we have:**

**We can do some grouping, with the formulas in mind.**

**Radical Example (using the conjugate):**

 by definition

;

**To simplify this, we can use the conjugate.**

**\*Foil out the top and simplify it. Do not foil out the bottom. Keep the components separate.**

; ***continue simplifying***

; ***reduce the h terms***

; ***apply the limit***

= **=**

**You Try:**

1. 3.
2. 4.

**Solutions:**

1. **2**. 3. 4.