**4.4 Rates of Change In Polynomial Functions**

Average Rate of Change:

Instantaneous Rate of Change:

**Example 1:** Determine the average rate of change from to on the function

**Method 1:** Use one of the formulas above.

**Method 2:** Graph the function and draw the \_\_\_\_\_\_\_\_\_\_\_ line, then calculate the slope of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ line between and . (Notice it is just moved right 2 and up 1)



**Example 2:** The graph of a polynomial function is shown. Estimate the instantaneous rate of change of f(x) at the point (-1,0).



**Method 1:** Determine the equation of the above function so that you can use one of the formulas at the top of page one.

 **Step 1:** Find the equation using factored form and then solving for a.

 **Step 2:** Use a formula from page 1.

**Method 2:** Draw a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ line for the function at the point (\_\_\_,\_\_\_\_). Then calculate the \_\_\_\_\_\_\_\_\_ of the tangent line.

**Example 3:** Consider . Find the equation of the tangent line at .

**Step 1**: Sketch the function so that you have an idea of whether the slope of the tangent line should be positive or negative.

**Step 2:** Use the instantaneous rate of change formula (the difference quotient) to determine the instantaneous rate of change at x=2.

**Step 3:** The answer to step 2 will be the slope of the tangent line. Use the formula and sub in the slope.

**Step 4:** Sub in the point (2, \_\_\_) to find the b.

**Step 5:** Write out the equation.

**Example 4:** Graph the function and estimate where the instantaneous rate of change is positive, negative and zero.

**Step 1:** Factor to find zeros

**Step 2:** Graph

**Step 3:** Circle in pencil where the graph is increasing, circle in pen where it is decreasing and highlight where there is a local max or min.

**Step 4:** Determine the exact coordinates of the local max and local minimums by using the instantaneous rate of change formula and equating it to zero. (for a level 4 – otherwise just estimate)

**Step 5:** Write out the intervals.