**Colorado Technical University**

**Course:** MATH205 – Differential Calculus

#### Unit 3 Part 5 Readings: Infinite Limits

**Infinite limits**

Plug in larger and larger numbers in a table to see if there is a pattern

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | 1x |  | x | 2x |
| 1 | 1 | 1 | 2 |
| 2 | 0.5 | 2 | 4 |
| 4 | 0.25 | 4 | 8 |
| 10 | 0.1 | 10 | 20 |
| 100 | 0.01 | 100 | 200 |
| 1,000 | 0.001 | 1,000 | 2,000 |
|  |  | 10,000 | 20,000 |

The sign can be critical: ∞ and −∞ are NOT the same thing!

For polynomials: look at the degree of the function (the highest exponent in the function)

When the degree is:

 greater than 0, the limit is infinity (or −infinity: check the coefficient)

 less than 0, the limit is 0

 0 or unknown then we need to work a bit harder

For ratios: compare the degree of the top (numerator) to the degree of the bottom

(denominator)

If the degree of the top is less than the degree of the bottom the limit is 0

If the degree of the top is greater than the degree of the bottom the limit is positive or negative

infinity (look at the sign of the coefficient)

If the degree of the top is the same as the degree of the bottom, divide the coefficients of the

terms with the largest exponent

**wolframalpha.com**

limit x->∞ (5x^2+1)/(3x^2−x)

**Increments**

 is an ***operator*** (like + - × ÷), ***not*** multiplying variables

An increment Δ is the final value minus the initial value:

 Δ*x* (the change in *x*) = *x*final - *x*initial

 Δ*y* (the change in *y*) = *y*final - *y*initial

**Graphs & algebra**

*y* = 3*x*

*y*1 = 3*x*1 initial point

*y*1 + Δ *y* = 3(*x*1 + Δ *x*) point after change

Δ *y* = 3(*x*1 + Δ *x*) - *y*1 the increment of *y*

 next plug in *y*1 = 3*x*1:

Δ *y* = 3(*x*1 + Δ *x*) -3*x*1

Δ *y* = 3*x*1 + 3Δ *x* -3*x*1

Δ *y* = 3Δ *x*

