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CMSC 270 Data Structures

HWK 0

IHRTLUHC

**Q1. Polynomials:**

* I did a brief review of limits before answering this question. I used this website:
  + [https://math.libretexts.org/Courses/Monroe\_Community\_College/MTH\_210\_Calculus\_I\_(Professor\_Dean)/Chapter\_2\_Limits/2.5%3A\_Limits\_at\_Infinity - :~:text=To evaluate the limits at,at large values of x.](https://math.libretexts.org/Courses/Monroe_Community_College/MTH_210_Calculus_I_(Professor_Dean)/Chapter_2_Limits/2.5%3A_Limits_at_Infinity#:~:text=To%20evaluate%20the%20limits%20at,at%20large%20values%20of%20x.)

A.

In this case, the limit as x goes to infinity of both polynomials exists, and

lim𝑥→±∞𝑓(𝑥) = lim𝑥→±∞ 𝑎𝑛𝑥^n for any polynomial function of degree n. So, the end behavior of the function is based on the highest degree of the polynomial regardless of the other terms in the function. As the degree, n, gets larger, the rate of growth gets faster and faster, so function **ONE (1.)** f(x) = x^3 + 2x grows faster as the lim𝑥→+∞ than function two, f(x) = 7x^2 – 5x + 3

B.

This problem follows the rules I outlined in 1. So, since both the lim𝑥→+∞ of both functions exist, and x^7 is of a higher degree than x^6, the lim𝑥→+∞ of f(x) = x^7 - x^5 – x^3 – x approaches infinity faster than the lim𝑥→+∞ of f(x) = x^6 + 2844x^5 - x^4 + 273x^3. Therefore, function **ONE** grows faster than two.

C.

Because these two functions are of the same highest degree at n = 4, the coefficient attached to the highest degree term determines which grows at the fastest rate. Since the lim𝑥→+∞ of both functions exist, this means that function **TWO** f(x) = 4x^4 + x^3 grows faster than f(x) = x^4 as the limit approaches infinity because the coefficient of 4 in front of the highest degree term in function two vertically stretches the function to grow 4 times as fast as function one.

**Q2. Logarithms:**

A. Log2(X) = 8

X = 2^8 = **256**

B. log5(X) = log5(2) + 25

Log5(X) – log5(2) =25, get logs to same side

Log5(x/2) = 25, apply quotient log rule

5^25 = x/2, multiply each side by 2

**X = (2 \* 5^25)**

C. X = log4(32)

4^X = 32,

2^(2X) = 2^5, Cancel the 2’s,

2X = 5, divide by two,

**X = 5/2**

**Q3. Working with Objects:**

In this case, the elements of the greetings array would be {“Howdy”, “Hello”, “Hey”}

As the program is read, it starts in the main and executes the generation of a String array object called greetings with the original three elements. Next, it encounters the change method which takes in a String array object. The greetings array is used, so the change method executes by changing the zeroth element of the array (“Hi”) to (“Howdy”). The method concludes there, and the overall program ends at the \*?\* yielding the three element greetings array object as {“Howdy”, “Hello”, “Hey”}.

**Q4. Working with Classes**

-This program is written in the .java file attached to my submission.

Here is a result of three rolls: **Text

Description automatically generated**