END BEHAVIOR OF RATIONAL FUNCTIONS

Assumed prior knowledge:

a) TI-83 techniques
   - function graphing and window management
   - table generation

b) Algebra concepts or notation
   - Division of polynomials to produce a polynomial quotient
   - Understanding of “as X approaches a value, the corresponding Y approaches a value.

1. Graph: \( Y_1 = \frac{1}{X} \)

2. Graph: \( Y_2 = \frac{1}{X^2} \)

3. Inspect the graph of \( Y_1 \):
   
   A) What value does Y seem to approach as the X-values become very large?
   
   B) What value does Y seem to approach as the X-values become very small?

4. Inspect the graph of \( Y_2 \):
A) What value does Y seem to approach as the X-values become very large?  

B) What value does Y seem to approach as the X-values become very small?

5. Using the “TABLE” capability of your calculator, create a table of X, Y₁ and Y₂ values for very large values for X.

6. Using the “TABLE” capability of your calculator, create a table of X, Y₁ and Y₂ values for very small values for X.

7. Using your knowledge for dividing polynomial functions, what is the polynomial quotient associated with:

   A) Y₁ : __________________

   B) Y₂ : __________________

8. Graph: \( Y₃ = \frac{X^2 + 1}{X} \)

9. Inspect the graph of Y₃:

   A) What value does Y seem to approach as the X-values become very large?

   B) What value does Y seem to approach as the X-values become very small?

10. Using the “TABLE” capability of your calculator, create a table of X and Y₃ values for very large and very small values for X.
11. Using your knowledge for dividing polynomial functions, what is the polynomial quotient associated with:

A) \( Y_3 \) ? : _________________

12. Graph the quotient function from \( Y_3 \) on the same graph as \( Y_3 \).

13. Graph: \( Y_4 = \frac{2X^2 + 3X - 2}{X^2 - 5} \)

14. Inspect the graph of \( Y_4 \):

A) What value does \( Y \) seem to approach as the \( X \)-values become very large? ________________________________________________

B) What value does \( Y \) seem to approach as the \( X \)-values become very small? ________________________________________

15. Using the “TABLE” capability of your calculator, create a table of \( X \) and \( Y_4 \) values for very large and very small values for \( X \).

16. Using your knowledge for dividing polynomial functions, what is the polynomial quotient associated with:

A) \( Y_4 \) ? : _________________

17. Graph the quotient function from \( Y_4 \) on the same graph as \( Y_4 \).

18. Compare the graph, table and polynomial quotient for \( Y_1, Y_2, Y_3 \) and \( Y_4 \). Is there a connection among these results for very large and very small values of \( X \)?

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