Descartes' Rules Name: Per:

1. Consider $f(x) = 2x^4 - x^3 - 14x^2 + 19x - 6$
   (a) What are the factors of the last term (-6)?
   $\pm 1 \pm 2 \pm 3 \pm 6$
   (b) What are the factors of the first term (2)?
   $\pm 1 \pm 2$
   (c) What is the List of possible rational zeros?
   $\{\pm 1 \pm 2 \pm 3 \pm 6 \pm \frac{1}{2} \pm \frac{3}{2}\}$
   (d) Use Descartes' Rule

$$\begin{array}{rcccc} + & - & - & + & - \\ f(x) = 2x^4 & -x^3 & -14x^2 & +19x & -6 \\ f(-x) = 2x^4 & +x^3 & -14x^2 & -19x & -6 \\ + & + & - & - & - \end{array}$$

   i. 4^{th} degree polynomial, so 4 zeros (counting repeats, that is!.. the real word is "multiplicity")
   ii. 3 variations for positive x means 3 or 1 positive zeros
   iii. 1 variations for negative x mean 1 negative zero

   (e) Now select possible rational zeros, and use synthetic division to see if there is a remainder.

2. Consider $f(x) = x^4 - 8x^3 + 21x^2 - 22x + 8$
   (a) What are the factors of the last term?
   (b) What are the factors of the first term?
   (c) What is the List of possible rational zeros?
   (d) Use Descartes' Rule
   i. How many zeros?
   ii. How many positive zeros?
   iii. How many negative zeros?
   (e) Now select possible rational zeros, and use synthetic division to see if there is a remainder.

3. Consider $f(x) = x^5 + 2x^4 - 10x^3 - 20x^2 + 9x + 18$
   (a) What are the factors of the last term?
   (b) What are the factors of the first term?
   (c) What is the List of possible rational zeros?
   (d) Use Descartes' Rule
      i. How many zeros?
      ii. How many positive zeros?
      iii. How many negative zeros?
   (e) Now select possible rational zeros, and use synthetic division to see if there is a remainder.

4. Consider
   $f(x) = 2x^6 - 3x^5 - 14x^4 + 10x^3 + 18x^2 - 7x - 6$
   (a) What are the factors of the last term?
   (b) What are the factors of the first term?
   (c) What is the List of possible rational zeros?
   (d) Use Descartes' Rule
      i. How many zeros?
      ii. How many positive zeros?
      iii. How many negative zeros?
   (e) Now select possible rational zeros, and use synthetic division to see if there is a remainder.