

READ THESE DIRECTIONS BEFORE STARTING

- ❖ Write your name below on the space provided.
- ❖ This test has a total of 6 pages.
- ❖ Work the problem in the space provided. If you need more space, write on the back of the test.
- ❖ To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
- ❖ Look only at your test. Don't give the impression that you are cheating.
- ❖ Be sure to write neatly and in pencil. If I cannot read what was written, do not expect the problem to be graded.
- ❖ If you finish early, go over the test again.

Good luck!

Number	Maximum	Score
1	3	
2	12	
3	6	
4	4	
5	9	
6	9	
7	2	
8	6	
9	7	
10	8	
11	15	
12	3	
13	6	
14	4	
15	6	
Total	100	

Name _____

Circle final answers

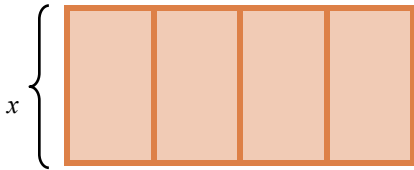
1) (3 points) Solve for the variable in $x^4 - 1 = 0$. *Hint, there are four answers.*

2) (2 points each) For the function $f(x) = 2x^2 - 8x + 1$, determine algebraically...

a) If it opens up or down. How do you know? b) The coordinates of the vertex:

c) The domain: d) The range: e) Interval of increase: f) Interval of decrease:

3) (6 points) Inspired by the game *Stardew Valley Crossing*, Mike decides to take up farming. He plans to build 4 adjacent, rectangular pens enclosed on all sides. He has 400 feet of fencing available. Determine a function that will relate the area of the enclosure to the width x and algebraically find the width x of the enclosure that maximizes the area. Also, what is the maximum area?



4) (4 points) Solve for the variable. $\frac{3x-7}{x^2-9} - \frac{5}{x-3} = \frac{7}{x+3}$

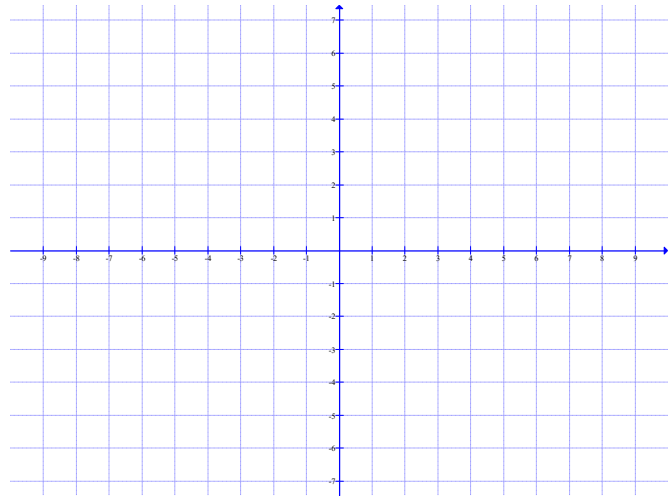
5) (3 points each) For the function $f(x) = (x + 3)(x - 2)^2(x - 5)\dots$

a) Find the leading term and state which quadrants the arrowheads will be in and why:

c) Sketch the graph based on parts *a* and *b*:

b) Fill in the chart:

Zero	Multiplicity	Touch/Cross



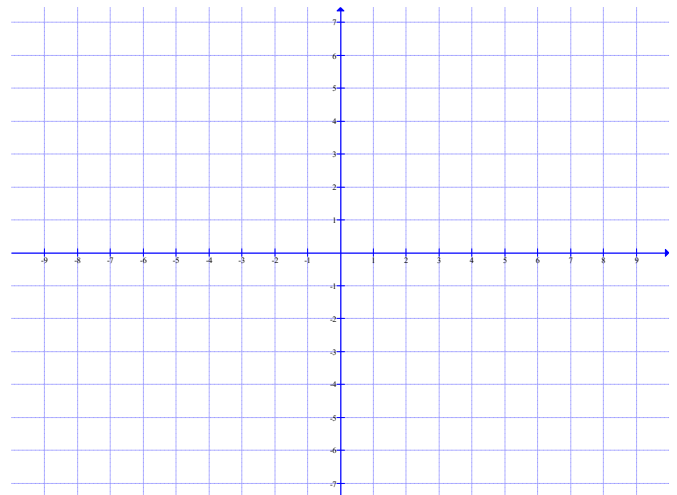
6) (3 points each) For the function $f(x) = -3x^4 + 12x^2\dots$

a) Find the leading term and state which quadrants the arrowheads will be in and why:

c) Sketch the graph based on parts *a* and *b*:

b) Fill in the chart:

Zero	Multiplicity	Touch/Cross



7) (1 point each) Fill in the blank:

If c is a zero of a function f , then $f(c) = \underline{\hspace{2cm}}$, and $\underline{\hspace{2cm}}$ is a factor.

8) (2 points each) Form a polynomial function of degree four that meets the following requirements.

Be sure to leave your answer in factored form:

a) Has zeros at 2, 1, 6, and -4 :

b) Has the same zeros and multiplicity as in part *a* but is a different function:

c) Has a zero at $1 - 5i$, and 8 is a zero of multiplicity 2:

9) (3 pts *a*; 2 pts others) Consider the functions $f(x) = 6x^3 + x^2 - 12x + 5$ and

$$g(x) = 3x^2 + 2x + 1.$$

a) Divide $f(x)$ by $g(x)$ using long division:

b) Based on your work in part *a*, was $g(x)$ a factor of $f(x)$? Why or why not?

c) What is the equation of the oblique asymptote of the rational function $y = \frac{6x^3 + x^2 - 12x + 5}{3x^2 + 2x + 1}$?

10) (8 points) Factor the polynomial completely by first listing the possible rational roots and then using synthetic division and your calculator.

$$g(x) = x^4 - 6x^3 + 22x^2 - 48x + 40$$

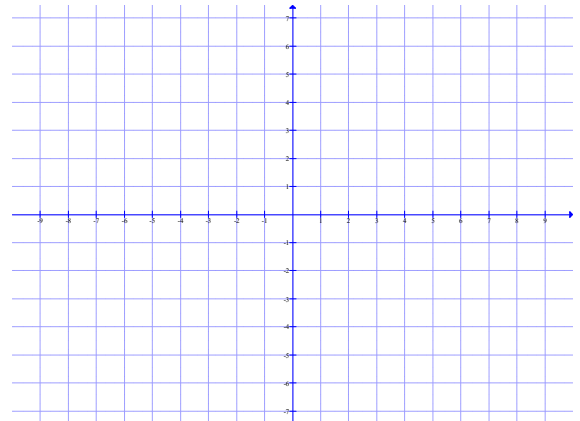
11) (3 points each) For the function $f(x) = \frac{x+1}{x^2-2x-3}$, find...

a) The domain: b) The x - and y -intercepts: c) Any vertical asymptotes and holes:

d) Any horizontal or oblique asymptotes:

e) Sketch a graph based on the work above.

Hint: you should see a transformation of $y = \frac{1}{x}$ in your work. Use that!



12) (3 points) Solve for the variable. Write answer in interval notation:

$$(x - 4)(x + 2)^2 > 0$$

13) (3 points each) Short answer. Clearly explain how to find the following algebraically:

a) Vertical Asymptotes and Holes:

b) Horizontal and Oblique Asymptotes:

14) (1 point per space) Fill in the blank:

a) A polynomial of degree n will have at most _____ x -intercept(s).

b) If the multiplicity of a real zero is even, the graph _____ the x -axis at that value while if the multiplicity of a real zero is odd, the graph _____ the x -axis at that value.

c) Numbers not in the domain of a rational function lead to _____.

15) (2 points each) Short answer:

a) What is the relationship between the multiplicities of all of the factors of a polynomial and the degree?

b) True or False. If false, explain why not: When we graph a function, we can see all possible zeros for that function.

c) Explain why an odd-degree polynomial must have at least one real zero.