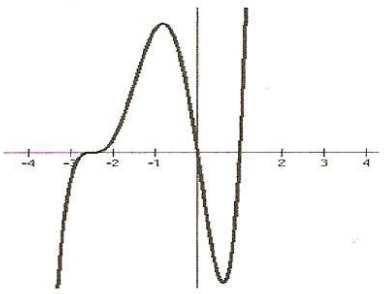
Pre-Calculus Worksheet Name: Key

Section 2.2 – Polynomial Functions DAY ONE Period: _____

I. Find the requested information for each graph.

1.



End Behavior: ↓ ↑

Even or Odd Degree? odd

+ or - Leading Coeff.: +

# of relative extrema: 2

Zeros and their Muliplicity:

$-\frac{5}{2}$ triple

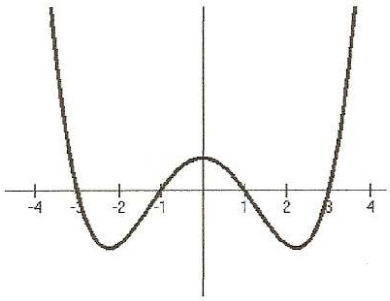
0 single

1 single

Possible Function (factored form):

$y = +x(2x+5)^3(x-1)$

2.



End Behavior: ↑ ↑

Even or Odd Degree? even

+ or - Leading Coeff.: +

# of relative extrema: 3

Zeros and their Muliplicity:

−3 single

−1 single

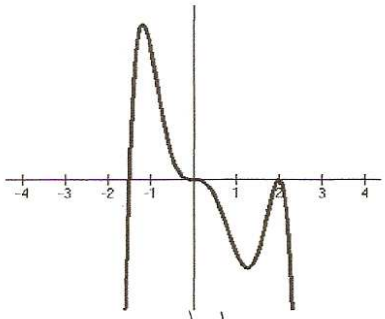
1 single

3 single

Possible Function (factored form):

$y = +(x+3)(x+1)(x-1)(x-3)$

3.



End Behavior: ↓ ↓

Even or Odd Degree? even

+ or - Leading Coeff.: −

# of relative extrema: 3

Zeros and their Muliplicity:

$-\frac{3}{2}$ single

0 triple

2 double

Possible Function (factored form):

$y = -x^3(2x+3)(x-2)^2$

II. Determine the **MAXIMUM** possible number of relative extrema for each polynomial function. State the end behavior of the curve as well.

4. $y = \frac{1}{3}x^5 - 2x^4 + \ldots + x - 6$

5 − 1 = 4 ↓ ↑

5. $y = -5x^4 + 3x^3 + \ldots - 2x + 4$

4 − 1 = 3 ↓ ↓

6. $y = -2x^{11} + x^{10} + \ldots + 5x - 1$

11 − 1 = 10 ↑ ↓

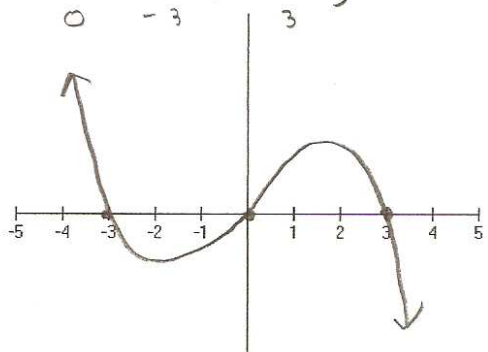
III. Factor each polynomial. Then identify its roots (and their multiplicity) along with its end behavior if order to sketch a graph of the function WITHOUT the calculator.

7. $f(x) = -x^3 + 9x$ ↑ ↓

$f(x) = -x(x^2 - 9)$

$f(x) = -x(x+3)(x-3)$

0 −3 3



8. $g(x) = 4x^2 - x^4$ ↓ ↓

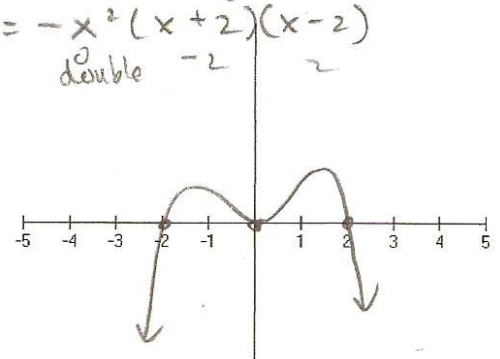
$g(x) = -x^4 + 4x^2$

$g(x) = -x^2(x^2 - 4)$

$g(x) = -x^2(x+2)(x-2)$

0 −2 2

double



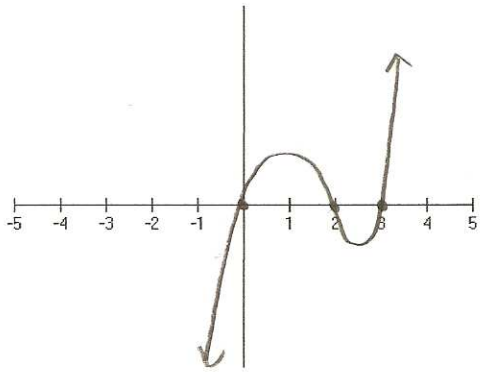
$f(x) = -x^5 - 5x^4$

9. $f(x) = +3x^3 - 15x^2 + 18x$ ↓↑

$f(x) = 3x(x^2 - 5x + 6)$

$f(x) = 3x(x-3)(x-2)$

0 3 2



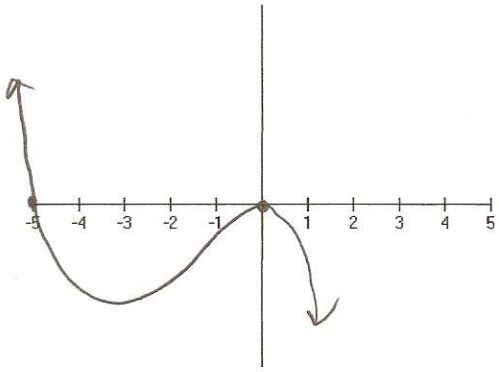
10. $f(x) = -5x^4 - x^5$ tricky! ↑↓

$f(x) = -x^4(x+5)$

-5

0

mult of 4 ← bounce

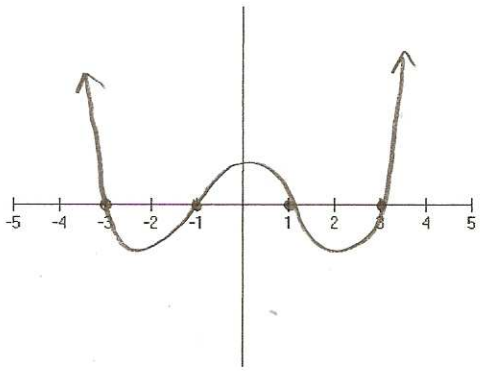


11. $g(x) = +x^4 - 10x^2 + 9$ ↑↑

$g(x) = (x^2 - 9)(x^2 - 1)$

$g(x) = (x-3)(x+3)(x-1)(x+1)$

3 −3 1 −1

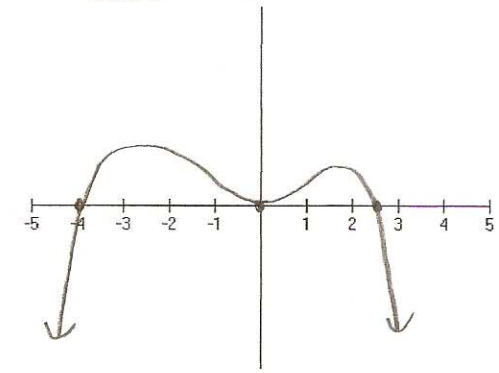


12. $f(x) = -4x^4 - 6x^3 + 40x^2$ ↓↓

$f(x) = -2x^2(2x^2 + 3x - 20)$ 40, 8, −5

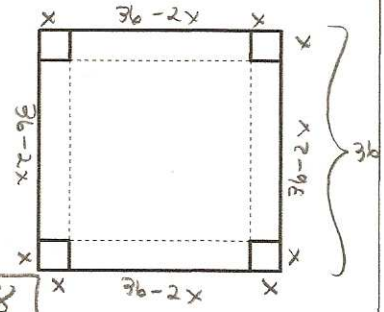
$f(x) = -2x^2(2x-5)(x+4)$

0 double $\frac{5}{2}$ −4



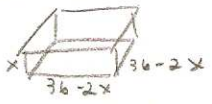
IV. Numerical and Graphical Analysis... Use your brain!

13. An open box is to be made from a square piece of material, 36 inches on a side, by cutting equal squares with sides of length x from the corners and turning up the sides (see figure).



(a) Verify that the volume of the box is given by the function $V(x) = x(36-2x)^2$.

Show your work. Mark the diagram as well.



$V(x) = l \cdot w \cdot h$

$V(x) = x(36-2x)^2$ ✓

(b) Determine the domain of the function (within the constraints of the problem).

$x > 0$ and $36 - 2x > 0$

$-2x > -36$

$x < 18$

so $0 < x < 18$

(c) Use a graphing utility to graph V and use the graph to estimate the value of x for which $V(x)$ is maximum.

What are the resulting dimensions of the box and what is the maximum volume? **HINT: 2nd TRACE 5**

relative maximum @ (6, 3456)

$x = 6$ dimensions are 6in × 24in × 24in for a volume of 3456in^3