Name Key

Trig – Unit 1 – Review for Mini Celebration of Knowledge

For 1 – 4, state the Vertex and Axis of Symmetry for each function. State if the vertex is a maximum or minimum.

1) $g(x) = -x^2 - 6x - 5$ — going Down so max

a b c

Standard Form → $x = -b/2a$

$x = \frac{-(-6)}{2(-1)} = \frac{6}{-2} = -3$ AOS ⇒ $x=-3$

$g(-3) = -(-3)^2 - 6(-3) - 5$
$= -9 + 18 - 5$
$= 4$

V(-3,4) max

2) $h(x) = -\frac{1}{2}(x+5)(x-1)$ — going down (max)

p q

intercept Form

$x = \frac{p+q}{2} = \frac{-5+1}{2} = \frac{-4}{2} = -2$

A.O.S. ⇒ $x=-2$

$h(-2) = -\frac{1}{2}(-2+5)(-2-1)$
$= -\frac{1}{2}(3)(-3) = \frac{9}{2}$

V(-2, -9/2) max

3) $y - 4 = 2(x+5)^2 + 3$ — going up so min

+4 +4

$y = 2(x+5)^2 + 7$

vertex Form → change, Keep

V(-5,7) min

A.O.S is the x of the vertex AOS ⇒ $x=-5$

4) $f(x) = x^2 - 81$ — positive so min

Vertex Form

$f(x) = (x+0)^2 - 81$

change Keep

V(0,-81) min

AOS ⇒ $x=0$

For 5 – 7, state the domain and range for the function

Domain → All Real Numbers for Parabolas

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

D: $(-\infty,\infty)$

R: $(-\infty,6]$

set equal to zero

$2x+3=0$
$2x=-3$
$x=-3/2$

$f(-3/2) = -(2(3/2)+3)^2+6 = 6$

6) $h(x) = 4x^2 - 4x + 1$ — Going up

a b c

$x = -b/2a = -(-4)/2(4) = \frac{4}{8} = \frac{1}{2}$

$h(1/2) = 4(1/2)^2 - 4(1/2) + 1 = 0$

D: $(-\infty,\infty)$

R: $[0,\infty)$

R → depends on Vertex so find the vertex

7) $g(x) = 3(x+2)(x-5)$ — ~~Going~~ Going up

p q

$\frac{p+q}{2} = \frac{-2+5}{2} = \frac{3}{2}$

$g(3/2) = 3(\frac{3}{2}+2)(\frac{3}{2}-5) = \frac{-147}{4}$

D: $(-\infty,\infty)$ R: $[\frac{-147}{4},\infty)$

For 8 – 13, state whether each is a polynomial. Write yes or no.

8) $h(x) = \frac{1}{2}x^{11} - 6x^7 + x^5$

Yes

9) $g(x) = 2\sqrt[3]{x-5} + 6$

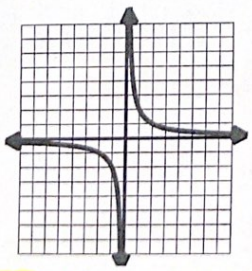
No $x^{1/3}$

x can't be a decimal/fraction

10) $f(x) = 3^{-6} + x$

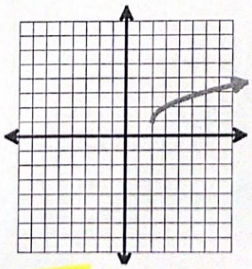
Yes (x is to the 1 power)

11)



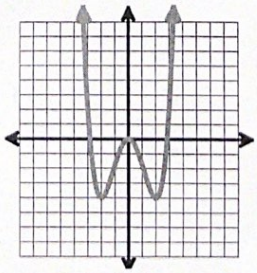
No this is the graph of $\frac{1}{x}$ or x^{-1} power

12)



No this is a $\sqrt{x}$ graph

13)



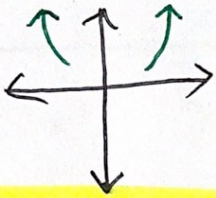
Yes x^4 graph

All about the Degree & Leading Coefficient

For 14 – 16, state the end heavier of each function using either interval or end behavior notation.

14) $f(x) = 1.2x^4 - x^3 - 5$

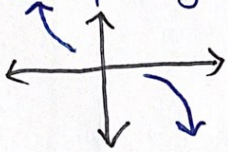
even degree & positive L.C.



$(\uparrow,\uparrow)$ or $x \to \pm\infty,\ f(x) \to +\infty$

15) $g(x) = -x^3 - 2x + 5$

Degree is odd & negative L.C.

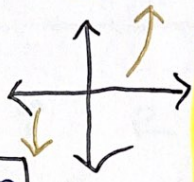


$(\uparrow,\downarrow)$ or $x \to -\infty,\ f(x) \to +\infty$

$x \to +\infty,\ f(x) \to -\infty$

16) $-130x^3 - 2x^2 + 3x^5 - 3$

positive & odd degree L.C.



$(\downarrow,\uparrow)$ or

$x \to -\infty,\ f(x) \to -\infty$

$x \to +\infty,\ f(x) \to +\infty$

For 17 – 18, state the multiplicity for the following zeros. Then state if those zeros cross the x-axis or bounce.

17) $f(x) = x^3(x-5)^2(x-1)^1$

x^3 is $(x+0)^3$

$x = 0$

triple

$(x-5)^2$

$x = 5$

double

$x - 1 = 0$

$x = 1$

single

18) $y = (x+1)(x-4)(x-1)^2$

$x + 1 = 0$

$x = -1$

single

$x - 4 = 0$

$x = 4$

single

$x - 1 = 0$

$x = 1$

double

① Decide the number of zeros

② Graph to find zeros then prove

For 19 – 24, find all the zeros for each of the following functions – work must be shown to receive credit. Simply putting it into the calculator, and writing the zeros will receive no credit for a correct answer.

3 zeros

19) $f(x) = x^3 - 4x$

Calculator says zeros @ $x = -2, 0, 2$

Prove:

Factor $\dfrac{x^3 - 4x}{x}$

$x(x^2 - 4)$

Perfect square

$x(x-2)(x+2)$

$x = 0$ $\quad x - 2 = 0$ $\quad x + 2 = 0$

$x = 2$ $\quad x = -2$

3 zeros

20) $g(x) = x^3 + 5x^2 - 4x - 20$

Calculator says: $-2, 2, -5$

Prove:

-5	1	5	-4	-20
	↓	-5	0	20
	1	0	-4	☺
	x^2	x	no x	R

$x^2 + 0x - 4 = 0$

$x^2 - 4 = 0$

Factor

$(x-2)(x+2) = 0$

$x - 2 = 0$ $\quad x + 2 = 0$

$x = 2$ $\quad x = -2$ $\quad x = -5$

3 zeros

21) $h(x) = x^3 + 11x^2 + 39x + 45$

Calculator says: $-5, -3$

-5	1	11	39	45
	↓	-5	-30	-45
	1	6	9	0
	x^2	x^1	no x	R

$x^2 + 6x + 9 = 0$

Factor

$(x+3)(x+3) = 0$

$x+3=0 \quad x+3=0$

$x=-3$ multiplicity of 2 or double

$x=-5$

3 zeros

22) $y = 3x^3 - 10x^2 - 13x + 20$

Calculator says: $1, 4, -5/3$

4	3	-10	-13	20
	↓	12	8	-20
	3	2	-5	0
	x^2	x^1	no x	R

$3x^2 + 2x - 5 = 0$

Factor → -3, 5, 2, -15

$(3x^2 - 3x)(+5x - 5)$

$3x$ $\quad$ 5

$\frac{3x(x-1) \quad 5(x-1)}{(x-1)}$

$(3x+5)(x-1) = 0$

$3x+5=0$

$x = -5/3$

$x-1=0$

$x=1$

$x=4$

23) $f(x) = x^4 - 22x^2 - 75$

4 zeros

Calculator: $-5, 5$

Factor via u-substitution $\quad u = x^2$

$u^2 - 22u - 75$

-25, 3, -75, -22

$(u-25)(u+3)$

$(x^2-25)(x^2+3)$

perfect square $\quad$ imaginary perfect square

$(x-5)(x+5)$

$x-5=0 \quad x+5=0$

$x=5 \quad x=-5$

$(x+3i)(x-3i)$

$x+3i=0 \quad x-3i=0$

$x=-3i \quad x=3i$

24) $g(x) = x^3 + x^2 + 4x + 4$

3 zeros

Calculator says: -1

-1	1	1	4	4
	↓	-1	0	-4
	1	0	4	0
	x^2	x^1	no x	R

$x^2 + 0x + 4$

$x^2 + 4$

imaginary perfect square

$(x+2i)(x-2i)$

$x+2i=0 \quad x-2i=0$

$x=-1 \quad x=-2i \quad x=2i$

Even degree & Negative L.C.

ODD Degree & Positive

For 25 – 26, graph the following functions. Label the x-intercepts, y-intercepts, domain, range, and end behavior.

Factor/Synthetic

25) $f(x) = -6x^4 + 9x^3$

GCF $= -3x^3$

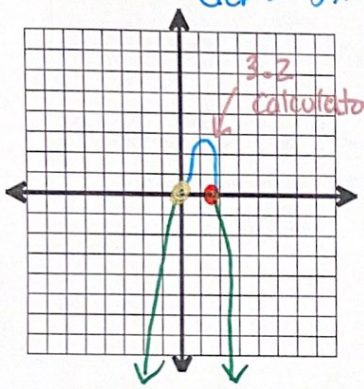
multiplicity is odd

multiplity is odd

$-3x^3(2x-3)=0$

cross @ 0

cross @ $x = 3/2$



D: $(-\infty, \infty)$

R: $(-\infty, 3.2]$

x – int: $0, 3/2$

y – int: 0

End: $(\downarrow, \downarrow)$

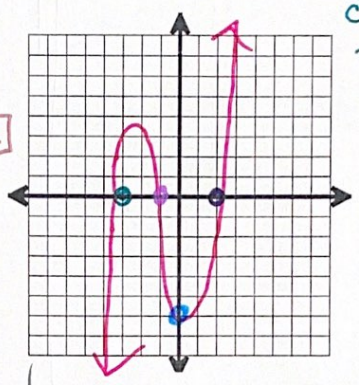
26) $g(x) = x^3 + 2x^2 - 5x - 6$

$(x+3)(x+1)(x-2)$

cross @ -3

cross @ -1

cross @ 2



D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

x – int: -3

y – int: -6

End:

For 27 – 30, use long or synthetic division to divide.

27) $\frac{10x^4-24x^3-15x^2-45x-27}{2x^2+6x+3}$

$5x^2 - 27x + 66 + \frac{-360x-225}{2x^2+6x+3}$

$2x^2+6x+3 \overline{\big)\, 10x^4-24x^3-15x^2-45x-27}$

$(-)\ 10x^4+30x^3+15x^2$

$-54x^3-30x^2-45x$

$(-)\ -54x^3-162x^2-81x$

$132x^2+36x-27$

$(-)\ 132x^2+396x+198$

$-360x-225$

28) $\frac{-4x^3-28x^2-21x+18}{x+6}$

$x+6=0$

$x=-6$

-6	-4	-28	-21	$+18$
	DROP	24	24	-18
		Add down		
	-4	-4	3	☺
	x^2	x^1	no x	R

multiply diagonally

$-4x^2-4x+3$

29) ~~$\frac{4x^4+8x^3+x^2-x-14}{x+2}$~~

30) ~~$(5x^3+3x^2+55x-4) \div (x^2-1)$~~

Next Page

29) $\frac{-4x^4+x^2-9x^3+21-x+x^5}{x+2}$

not in standard form

$$\frac{x^5-4x^4-9x^3+x^2-x+21}{x+2}$$

$x+2=0$

$x=-2$

-2	1	-4	-9	1	-1	21
	↓	-2	12	-6	10	-18
	1	-6	3	-5	9	3
	x^4	x^3	x^2	x^1	no x	R

$$x^4-6x^3+3x^2-5x+9+\frac{3}{x+2}$$

30) $(x^4+3x^2+55)\div(x-1)$

has missing zeros

$$\frac{x^4+0x^3+3x^2+0x+55}{x-1}$$

$x-1=0$

$x=1$

1	1	0	3	0	55
	↓	1	1	4	4
	1	1	4	4	59
	x^3	x^2	x^1	no x	R

$$x^3+x^2+4x+4+\frac{59}{x-1}$$