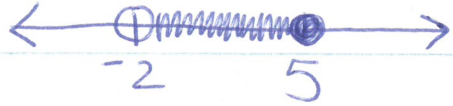
1) a. $-2 < x \le 5$



b. $x > 10$ or $-\infty < x \le 9$

2) $-1 < x \le 4$

3) $g(x) = |x|$ was reflected over the x-axis, vertically shrunk by a factor of ½, and translated right 5 units and up 2 units.

4) $y = 10(x-8)^2 - 6$

5) a. $r(-10) = -(-10)^2 + 9 = -100 + 9 = -91$

b. $h(x) + r(x) = 2x + 5 + (-x^2 + 9)$
$= 2x + 5 - x^2 + 9 = -x^2 + 2x + 14$

c. $h(x) - r(x) = 2x + 5 - (-x^2 + 9)$
$= 2x + 5 + x^2 - 9 = x^2 + 2x - 4$

d. $r(h(x)) = r(2x+5) = -(2x+5)^2 + 9$
$= -(4x^2 + 20x + 25) + 9 = -4x^2 - 20x - 25 + 9$
$= -4x^2 - 20x - 16$

6) a. $5x(2x^2 - 7x - 15) = 5x(x-5)(2x+3)$

b. $(3x-8)(3x+8)$

c. $y(x^2 - 20x + 100) = y(x-10)^2$

d. $((2x+1) - (x+3))((2x+1) + (x+3)) = (x-2)(3x+4)$

7) a. $f(x) = -2x^2 + 8x - 3 \rightarrow$ vertex: $(2, 5)$

$-\frac{b}{2a} = \frac{-8}{2(-2)} = \frac{-8}{-4} = 2$ $\quad f(2) = -2(2)^2 + 8(2) - 3$

$= -8 + 16 - 3 = 5$

axis of symmetry: $x = 2$, yint: $(0, -3)$

b. $g(x) = (x+9)^2 + 4 \rightarrow$ vertex: $(-9, 4)$

axis of symmetry: $x = -9$

y-int: $g(0) = (0+9)^2 + 4 = 81 + 4 = 85$

$(0, 85)$

8) a. $(4-6i) - (7+i) = 4 - 6i - 7 - i = -3 - 7i$

b. $(10-3i)(10+3i) = 100 - 30i + 30i - 9i^2$

$= 100 + 9 = 109$

c. $5i(2-9i) = 10i - 45i^2 = 10i + 45 = 45 + 10i$

9) a. $\sqrt{-81} = i\sqrt{81} = 9i \rightarrow$ complex (imaginary)

b. $(4i)(-3i) = -12i^2 = 12 \rightarrow$ real

c. $i^{40} = i^4 = i^2 \cdot i^2 = (-1)(-1) = 1 \rightarrow$ real

d. $3\sqrt{-24} + 2\sqrt{-54} = 3i\sqrt{24} + 2i\sqrt{54}$

$= 3i\sqrt{4 \cdot 6} + 2i\sqrt{9 \cdot 6} = 6i\sqrt{6} + 6i\sqrt{6} = 12i\sqrt{6}$

complex (imaginary)

10) $g(x) = -5x^2 - 20x + 15 \rightarrow y = -5(x+2)^2 + 35$

$\frac{-b}{2a} = \frac{20}{2(-5)} = \frac{20}{-10} = -2$ $\quad g(-2) = -5(-2)^2 - 20(-2) + 15$

$= -20 + 40 + 15 = 35$

11) $h(x) = 2(3x-2)^2 - 7$

$= 2(3x-2)(3x-2) - 7 = 2(9x^2 - 12x + 4) - 7$

$= 18x^2 - 24x + 8 - 7 = 18x^2 - 24x + 1$

12) a. $b^2 - 4ac = (-7)^2 - 4(15)(4) = -191$

two imaginary ~~complex~~ solutions

b. $b^2 - 4ac = 8^2 - 4(3)(2) = 40$

two real solutions

c. $b^2 - 4(a)(c) = (-6)^2 - 4(2)(9) = -36$

two imaginary solutions

13)
$$\begin{array}{r} 2x^2 - 4x + 5 \\ 3x - 1 \\ \hline -2x^2 + 4x - 5 \\ 6x^3 - 12x^2 + 15x + 0 \\ \hline 6x^3 - 14x^2 + 19x - 5 \end{array}$$

$6x^3 - 14x^2 + 19x - 5$

as $x \to \infty$, $y \to \infty$

as $x \to -\infty$, $y \to -\infty$

14) if "$x \to \infty$, $f(x) \to -\infty$" then the leading coefficient must be negative

if "$x \to -\infty$, $f(x) \to -\infty$", the degree must be even.

sample solution: $-2x^4 - 5x - 4$

15)
$$\begin{array}{r|rrrr} 5 & 1 & -9 & 15 & 25 \\ & & 5 & -20 & -25 \\ \hline & 1 & -4 & -5 & \underline{10} \end{array}$$

yes, $x-5$ is a factor

$x^2 - 4x - 5 = (x-5)(x+1)$

so $f(x) = (x-5)(x-5)(x+1) = (x-5)^2(x+1)$

$(5,0)$ has a multiplicity of 2

$(-1,0)$ has a multiplicity of 1

16)
$$\begin{array}{r|rrrr} -7 & 2 & 7 & -53 & -28 \\ & & -14 & 49 & 28 \\ \hline & 2 & -7 & -4 & 0 \end{array}$$

Zeros: $(-7,0)$

$(-\tfrac{1}{2}, 0)$, $(4,0)$.

$2x^2 - 7x - 4 = (2x+1)(x-4)$

17) Zeros: $-1, \sqrt{7}, -\sqrt{7}$

$f(x) = (x+1)(x-\sqrt{7})(x+\sqrt{7})$

$= (x+1)(x^2 - x\sqrt{7} + x\sqrt{7} - 7) = (x+1)(x^2-7)$

$f(x) = x^3 + x^2 - 7x - 7$

18) Zeros: $2i\sqrt{3}, -2i\sqrt{3}$

$f(x) = (x-2i\sqrt{3})(x+2i\sqrt{3})$

$= x^2 - 2i\sqrt{3}x + 2i\sqrt{3}x - 4i^2(3)$

$= x^2 - 12i^2 = x^2 + 12$

$f(x) = x^2 + 12$

19) a. $(2x+5)(3x^2+8x-3) = (2x+5)(3x-1)(x+3) = 0$

$x = -5/2, 1/3, -3$

b. $\sqrt{x-2} = x-4 \rightarrow (\sqrt{x-2})^2 = (x-4)^2$

$x-2 = x^2-8x+16$

$0 = x^2-9x+18 = (x-3)(x-6)$

$x = 3$ and 6 but

when you plug in 3, $\sqrt{3-2} = 3-4$

$\Rightarrow 1 \neq -1$

so 3 is extraneous and the solution is $x = 6$.

c. $\sqrt{\sqrt{x+5}} = 2 \qquad \sqrt{x+5} = 4 \qquad x+5 = 16$

$x = 11$

20) a. $(7x+3)^2 = (7x+3)(7x+3) = 49x^2 + 42x + 9$

b. $(x+1)(x+2)(x+3) = (x+1)(x^2+5x+6)$
$= x^2 + 6x^2 + 11x + 6$

c. $(x-2\sqrt{7})(x+2\sqrt{7}) = x^2 - 2\sqrt{7}x + 2\sqrt{7}x - 4(7)$
$= x^2 - 28$

21) a. $\sqrt[5]{x^3} = x^{3/5}$

b. $\dfrac{b^3}{c^{1/2}} \cdot \dfrac{c}{b^{1/3}} = b^{8/3} c^{1/2}$

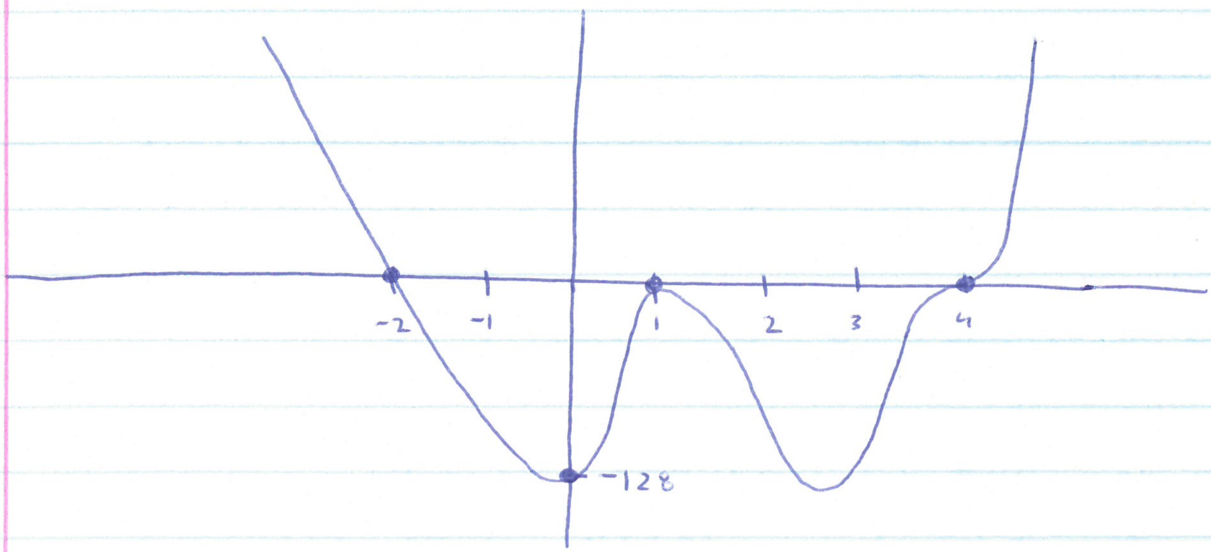
c. $\sqrt{(\sqrt[3]{x^2})^9} = (((x^2)^{1/3})^9)^{1/2} = x^3$

22) $\begin{array}{r|rrrr} -5 & 1 & k & -35 & -150 \\ & & -5 & 25+5k & 50+25k \\ \hline & 1 & -5+k & -10-5k & -100+25k \end{array} = 0$

$100 = 25k$ $\quad k = 4$

23) a. $(0, -1)$
b. $(-7, 0)$, $(-5, 0)$, $(-3, 0)$
c. $f(-2) = 3$
d. relative minimum
e. three solutions
f. $(-3, 0)$ has a multiplicity of 1
$(-1, 0)$ "
$(1, 0)$ "

24)



25) $\dfrac{x^{-2}(yz^3)^2}{y^3(zx^2)^{-1}} = \dfrac{x^{-2}y^2z^6}{y^3z^{-1}x^{-2}} = \dfrac{x^2y^2z^6z^1}{x^2y^3} = \dfrac{z^7}{y}$

26) three solutions to $x^3+1=0$

try -1

$$\begin{array}{r|rrrr} -1 & 1 & 0 & 0 & 1 \\ & & -1 & 1 & -1 \\ \hline & \underbrace{1 \quad -1 \quad 1}_{x^2-x+1=0} & & & \lfloor 0 \end{array}$$

$x = \dfrac{1 \pm \sqrt{(-1)^2-4(1)(+1)}}{2(1)}$

$= \dfrac{1 \pm \sqrt{-3}}{2} = \dfrac{1 \pm i\sqrt{3}}{2}$

Solutions: $x = -1, \dfrac{1 \pm i\sqrt{3}}{2}$

27) $$\begin{array}{r|rrrrr} 2 & 1 & 0 & 0 & -6 & -8 \\ & & 2 & 4 & 8 & 4 \\ \hline & 1 & 2 & 4 & 2 & \lfloor -4 \end{array}$$

$g(2) = -4$

28) a. $x = 3/2$, $y = 2$

b. $x \approx 2.2$ and $y \approx 1.27$

or $x \approx -4.54$ and $y \approx 3.51$

29) $x = -6$, $y = 2$, and $z = 8$

30) a. $y = 23.0571x + 144.357$

b. $.95 = r^2$ pretty good fit

c. \$328,814.29

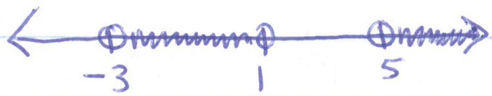
d. after 6.75 years

31) $(0,2)$, $(5,0)$ $\frac{0-2}{5-0} = \frac{-2}{5}$

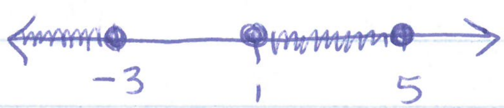
32) a. $-.667 < x < 0$,

b. $-\infty < x < -.667$, $0 < x < \infty$

33) a.



b.

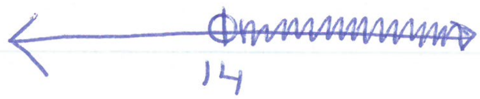


34) a. Domain: $-\infty < x < \infty$, Range: $y \geq -15.5$

b. Domain: $x \geq 4/5$, Range: $y \geq -3$

c. Domain: $x \geq 0$, Range: $y \leq 7$

35) $(-5, 41), \quad (-3, 19) \qquad \dfrac{19-41}{-3+5} = -11$

36) 

37) $x \approx 1.21$ and 5.79