

Chapter 3 Review

- 3.1
- $y = \sqrt{x+1}$ radical function
 - $y = 3x^4$ polynomial (degree 4)
 - $y = -3x^3 - 2x^2 + x$ polynomial (degree 3)
 - $y = \frac{1}{2}x + 7$ polynomial (degree 1)

- $y = x^4 - 3x^2 + 5x$ degree 4 starts in quad 2, ends in quad 1, y -int $(0,0)$ possibly 4 x -int.
 - $y = -x^3 + 5x^2 - x + 4$ degree 3 starts in quad 2 ends in quad 4 y -int $(0,4)$ possibly 3 x -int
 - $y = 3x - 2$ degree 1 starts in quad 3, ends in quad 1 y -int $(0,-2)$ 1 x -int.
 - $y = 2x^2 - 4$ degree 2 starts in quad 2 ends in quad 1 y -int $(0,-4)$ possibly 2 x -int.
 - $y = 2x^5 - 3x^3 + 1$ degree 5 starts in quad 3 ends in quad 1 y -int $(0,1)$ possibly 5 x -int.

3. $h = 11500 - 16t^2$

a) degree 2, quadratic

b) $h = 11500 - 16(12)^2 = 9196$ ft

c) $1500 = 11500 - 16t^2$

$$16t^2 = 10000 \quad t^2 = \frac{10000}{16} \quad t = \frac{100}{4} \quad t = 25 \text{ sec.}$$

d) $0 = 11500 - 16t^2$

$$16t^2 = 11500 \quad t^2 = \frac{11500}{16} \quad t \approx 26.8 \text{ sec}$$

3.2 4a) $2^3 + 9(2)^2 - 5(2) + 3$

$8 + 36 - 10 + 3$ remainder 37

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

$$\begin{array}{r} x-2 \overline{) x^3 + 9x^2 - 5x + 3} \\ \underline{x^3 - 2x^2} \\ 11x^2 - 5x \\ \underline{11x^2 - 22x} \\ 17x + 3 \\ \underline{17x - 34} \\ 37 \end{array}$$

$$x^2 + 11x + 17 + \frac{37}{x-2} \quad x \neq 2$$

$$4b) 2(-1)^3 + (-1)^2 - 2(-1) + 1$$

$$-2 + 1 + 2 + 1 \text{ remainder } 2$$

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

$$\begin{array}{r} 2x^2 - x - 1 \\ x+1 \overline{) 2x^3 + x^2 - 2x + 1} \\ \underline{2x^3 + 2x^2} \\ -x^2 - 2x \\ \underline{-x^2 - x} \\ -x + 1 \\ \underline{-x - 1} \\ 2 \end{array}$$

$$2x^2 - x - 1 + \frac{2}{x+1} \quad x \neq -1$$

$$c) 12 + 13 - 23 + 7 \text{ remainder } 9$$

$$\frac{12x^3 + 13x^2 - 23x + 7}{x-1}$$

$$x-1 \overline{) 12x^3 + 13x^2 - 23x + 7}$$

* Synthetic

$$\begin{array}{r|rrrr} -1 & 12 & 13 & -23 & 7 \\ & & -12 & -25 & -28 \\ \hline & 12 & 25 & -2 & -21 \end{array}$$

$$12x^2 + 25x - 2 + \frac{-21}{x-1}$$

$$x \neq 1$$

$$d) \text{ ~~12x^3 + 13x^2 - 23x + 7~~ } -8(-1)^4 - 4(-1) + 10(-1)^3 + 15$$

$$-8 + 4 - 10 + 15 \text{ remainder } 1$$

$$\frac{-8x^4 - 4x + 10x^3 + 15}{x+1}$$

$$\begin{array}{r|rrrrr} 1 & -8 & 10 & 0 & -4 & 15 \\ & & -8 & 18 & -18 & 14 \\ \hline & -8 & 18 & -18 & 14 & 1 \end{array}$$

$$-8x^3 + 18x^2 - 18x + 14 + \frac{1}{x+1}$$

$$x \neq -1$$

$$5a) 3^4 + k(3)^3 - 3(3) - 5 = -14$$

$$81 + 27k - 9 - 5 = -14$$

$$27k = -81$$

$$k = -3$$

$$5b) \quad x^4 - 3x^3 - 3x - 5$$

$$(-3)^4 - 3(-3)^3 - 3(-3) - 5$$

$$81 + 81 + 9 - 5 \quad \boxed{166}$$

$$6. \quad x-1: \quad 4 - 3 + b + 6$$

$$\quad \quad \quad b + 7$$

$$x+3: \quad -108 - 27 - 3b + 6$$

$$\quad \quad \quad = \quad -3b - 129$$

$$4b = -136$$

$$b = -34$$

3.3

7. a) $1^3 - 1 - 16 + 16 = 0$ 1 works $(x-1)$ is a factor

b) $(-1)^3 - (-1)^2 - 16(-1) + 16$

$$-1 - 1 + 16 + 16 = 30 \quad -1 \text{ doesn't work}$$

c) $-64 - 16 + 64 + 16 = 0$ -4 works $(x+4)$ is a factor

d) $64 - 16 - 64 + 16 = 0$ 4 works $(x-4)$ is a factor

8 a) check $-1 \quad -1 - 4 - 1 + 6 = 0 \quad (x+1)$

$$1 \quad \overline{1 \quad -4 \quad 1 \quad 6}$$

$$\quad \quad \underline{1 \quad -5 \quad 6}$$

$$1 \quad -5 \quad 6$$

$$x^2 - 5x + 6$$

$$\boxed{(x+1)(x-2)(x-3)}$$

b) check $-1 \quad 4 - 4 - 16 + 16 = 0 \quad (x+1)$

$$1 \quad \overline{-4 \quad -4 \quad 16 \quad 16}$$

$$\quad \quad \underline{-4 \quad 0 \quad 16}$$

$$-4 \quad 0 \quad 16$$

$$-4x^2 + 16$$

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

$$\boxed{-4(x+2)(x-2)(x+1)}$$

c) check $1 \quad 1 - 4 - 1 + 16 - 12 = 0 \quad (x-1)$

$$-1 \quad \overline{1 \quad -4 \quad -1 \quad 16 \quad -12}$$

$$\quad \quad \underline{-1 \quad 3 \quad 4 \quad -12}$$

$$1 \quad -3 \quad -4 \quad 12$$

$$x^3 - 3x^2 - 4x + 12$$

8c) check 2 $8 - 12 - 8 + 12 \checkmark (x-2)$

$$\begin{array}{r|rrrr} -2 & 1 & -3 & -4 & 12 \\ & & -2 & 2 & 12 \\ \hline & 1 & -1 & -6 & \\ & & x^2 & -x & -6 \end{array}$$

$$\boxed{(x-1)(x-2)(x-3)(x+2)}$$

d) check 1 $1 - 3 - 5 + 27 - 32 + 12 = 0 (x-1)$

$$\begin{array}{r|rrrrrr} -1 & 1 & -3 & -5 & 27 & -32 & 12 \\ & & -1 & 2 & 7 & -20 & 12 \\ \hline & 1 & -2 & -7 & 20 & -12 & \\ & & x^4 & -2x^3 & -7x^2 & +20x & -12 \end{array}$$

check 1 $1 - 2 - 7 + 20 - 12 = 0 (x-1)$

$$\begin{array}{r|rrrrr} -1 & 1 & -2 & -7 & 20 & -12 \\ & & -1 & 1 & 8 & -12 \\ \hline & 1 & -1 & -8 & 12 & \\ & & x^3 & -x^2 & -8x & +12 \end{array}$$

check 2 $8 - 4 - 16 + 12 = 0 (x-2)$

$$\begin{array}{r|rrrr} -2 & 1 & -1 & -8 & 12 \\ & & -2 & -2 & 12 \\ \hline & 1 & 1 & -6 & \\ & & x^2 & +x & -6 \end{array}$$

$$\boxed{(x-1)(x-2)^2(x+3)}$$

9. $V = 2x^3 + 7x^2 + 2x - 3$

check -1 : $-2 + 7 - 2 - 3 \checkmark (x+1)$

$$\begin{array}{r|rrrr} 1 & 2 & 7 & 2 & -3 \\ & & 2 & 5 & -3 \\ \hline & 2 & 5 & -3 & \\ & & 2x^2 & +5x & -3 \\ & & (2x-1)(x+3) & & \end{array}$$

a) $V = (x+1)(x+3)(2x-1)$

b) $x = 1$

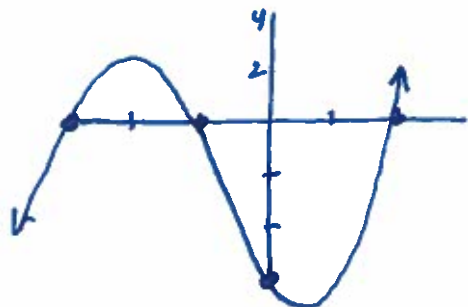
dimensions $2 \times 4 \times 1$

$$10 \quad (-3)^2 + 4(-3)^2 - 2K(-3) + 3 = 0$$

$$-27 + 36 + 6K + 3 = 0$$

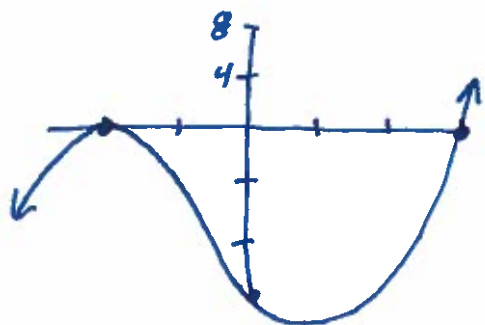
$$6K = -12 \quad K = -2$$

3.4) 11a) $y = (x+1)(x-2)(x+3)$
 x int $-1, 2, -3$ multiplicity 1 y int $(0, -6)$



positive $-3 < x < -1$ and $x \geq 2$
 negative $x < -3$ and $-1 < x < 2$

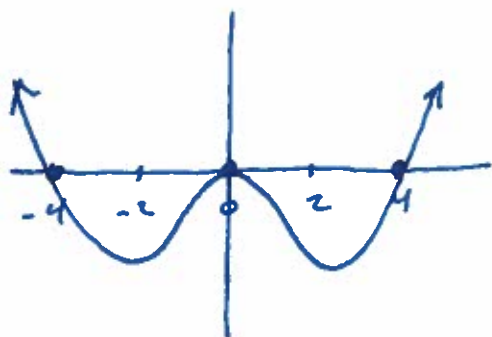
b) $y = (x-3)(x+2)^2$
 x int $3, -2$ (multiplicity 2) y int $(0, -12)$



positive $x \geq 3$
 negative $x < -2$ and $-2 < x < 3$

c) $y = x^4 - 16x^2 = x^2(x^2 - 16) = x^2(x+4)(x-4)$

x int 0 (multiplicity 2), $4, -4$ y int $(0, 0)$

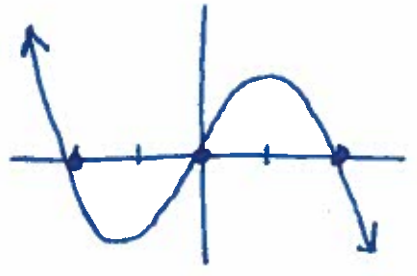


positive $x < -4$ and $x \geq 4$
 negative $-4 < x < 0$ and $0 < x < 4$

11d) $y = -x^5 + 16x = -x(x^4 - 16) = -x(x^2 + 4)(x^2 - 4)$

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

x int $0, -2, 2$ (singles) y int $(0, 0)$



positive $x < -2$ and $0 < x < 2$
 negative $-2 < x < 0$ and $x > 2$

12. $y = 2(-4(x-1))^3 + 3$

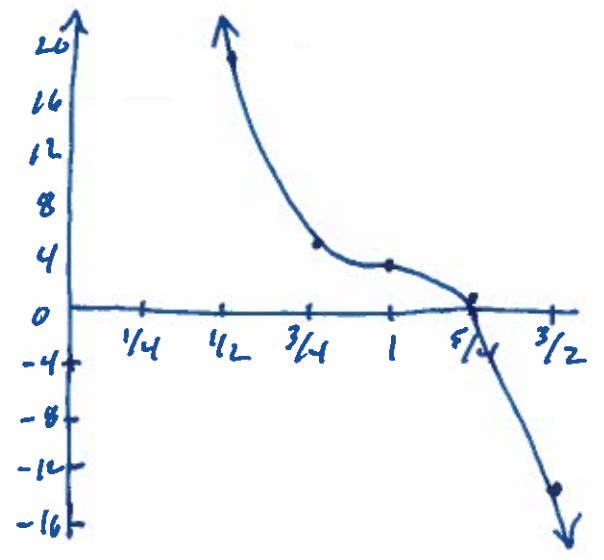
a) $VS = 2$ $VT = 3$
 R_y
 $HS = 1/4$ $HT = 1$

$a = 2$
 $b = -4$
 $h = 1$
 $k = 3$

c)

x	y
-2	-8
-1	-1
0	0
1	1
2	8

$-1/4x + 1$	$2y + 3$
$6/4$	-13
$5/4$	1
$4/4$	3
$3/4$	5
$2/4$	19



13a) -3 double
 -1 single

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

b) -1 single
 2 triple
 (-)

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

$$14 \text{ a) } V = (x+1)(x+2)(x-3)^2$$

$$V = -(x+1)(x+2)(x-3)^2$$

$$b) V = a(x+1)(x+2)(x-3)^2$$

$$24 = a(3)(4)(-1)^2$$

$$24 = 12a$$

$$a = 2$$

$$V = 2(x+1)(x+2)(x-3)^2$$

$$15 \text{ a) } V = L(L-5)(2L)$$

$$b) 384 = L(2L)(L-5)$$

$$384 = 2L^3 - 10L^2$$

$$0 = 2L^3 - 10L^2 - 384$$

$$0 = L^3 - 5L^2 - 192$$

check 8

$$(L-8) \begin{array}{r} 512 - 320 - 192 \checkmark \\ -8 \overline{) 1 \quad -5 \quad 0 \quad -192} \\ \underline{-8 \quad -24 \quad -192} \\ 1 \quad 3 \quad 24 \\ \star L^2 + 3L + 24 \\ \text{doesn't factor} \end{array}$$

$$\therefore L = 8$$

$$8 \text{ cm} \times 3 \text{ cm} \times 16 \text{ cm}$$