

Dynamics Study Guide - FINAL

2.7

$$\textcircled{23} \quad y = |x+2| - 4$$

Vertex $(-2, -4)$ a.o.s. $x = -2$

Shift 2 left, 4 down

$$\textcircled{25} \quad y = 3|x+6|$$

Vertex $(-6, 0)$ a.o.s. $x = -6$ Shift 6 left, stretch by factor of 3
(narrow)

$$\textcircled{27} \quad y = -|x-5|$$

Vertex $(5, 0)$ a.o.s. $x = 5$ Shift 5 right, reflected over x axis
(negative a)

$$\textcircled{29} \quad \text{Vertex } (5, 1)$$

opens down (negative a)

down 2, right 1

$$y = -2|x-5| + 1$$

A.K~~27~~

4.1

(27) $f(x) = -(x-4)^2 - 25$ ↙ max value

vertex: $(4, -25)$

a.o.s.: $x = 4$

max value: -25

domain: \mathbb{R}

range: $y \leq -25$

(29) $f(x) = (x-1)^2 + 2$ (vertex form)

vertex: $(1, 2)$ opens up, basic

$a = 1$

1	1/1
3	3/1
5	5/1

(see graph paper)

(31) $f(x) = 2(x-2)^2 + 5$ (vertex form)

vertex: $(2, 5)$ opens up, narrow

$a = 2$

1	2/1
3	6/1
5	10/1

(see graph paper)

(33) $y = -(x-1)^2 + 4$ (vertex form)

vertex: $(1, 4)$ opens down, basic

$a = -1$

1	-1/1
3	-3/1
5	-5/1

(see graph paper)

4.2

opens down

$$\textcircled{9} \quad y = -x^2 + 2x + 1 \quad (\text{Standard form})$$

$$\text{Vertex: } \frac{-b}{2a} = \frac{-2}{2(-1)} = \frac{-2}{-2} = \boxed{(1, 2)}$$

$$\begin{aligned} & -(1)^2 + 2(1) + 1 \\ & -1 + 2 + 1 = 2 \end{aligned}$$

$$\text{a.o.s. } x = 1$$

$$\text{Max value: } 2$$

$$\text{Range: } y \leq 2$$

$$\textcircled{17} \quad y = x^2 + 6x + 9$$

opens up,
basic

$$\frac{-b}{2a} = \frac{-6}{2(1)} = \frac{-6}{2} = (-3, 0)$$

$$\begin{aligned} & (-3)^2 + 6(-3) + 9 \\ & 9 - 18 + 9 = 0 \end{aligned}$$

$$a = 1$$

1	1/1
3	3/1
5	5/1

(see graph paper)

$$\textcircled{23} \quad y = 3x^2 - 12x + 10$$

opens up,
narrow

$$\frac{-b}{2a} = \frac{12}{2(3)} = \frac{12}{6} = (2, -2)$$

$$\begin{aligned} & 3(2^2) - 12(2) + 10 \\ & 12 - 24 + 10 \end{aligned}$$

$$a = 3$$

1	3/1
3	9/1
5	15/1

2.4

$$\textcircled{15} \quad x^2 + 5x + 6 = \boxed{(x+3)(x+2)} \quad \begin{array}{l} \swarrow \text{same signs} \\ \rightarrow \text{same sign} \end{array}$$

$$\textcircled{21} \quad -x^2 + 3x - 12 = -\boxed{(x^2 - 13x + 12)} =$$

$$\boxed{-(x-12)(x-1)}$$

$$\textcircled{23} \quad x^2 - 10x + 24 = \boxed{(x-6)(x-4)}$$

$$\textcircled{29} \quad c^2 + 2c - 63 = \boxed{(c+9)(c-7)}$$

different signs

$$\textcircled{33} \quad 25b^2 - 20b = \boxed{5b(5b-4)}$$

$$\textcircled{35} \quad 5t^2 - 5t - 10 = \boxed{5(t^2 - t - 2)}$$

$$\boxed{5(t+1)(t-2)}$$

$$\textcircled{37} \quad 27p^2 - 9p + 18 = \boxed{9(3p^2 - p + 2)}$$

$$\textcircled{41} \quad 2m^2 - 11m + 15$$

$$m^2 - 11m + 30$$

$$(m-6)(m-5)$$

$$\left(\frac{2m-6}{2}\right)\left(\frac{2m-10}{2}\right)$$

put the 2 back
in twice +
reduce!

$$\boxed{(m-3)(2m-5)} \quad \text{check with FOIL}$$

$$\textcircled{47} \quad x^2 + 2x + 1 = (x+1)(x+1) = \boxed{(x+1)^2}$$

$$\textcircled{53} \quad x^2 - 4 = \boxed{(x+2)(x-2)}$$

$$\textcircled{57} \quad A = lw \quad l, w \text{ are the same since its a square}$$

$$25x^2 - 10x + 1 = (5x-1)^2$$

$$\boxed{(5x-1) \text{ cm by } (5x-1) \text{ cm}}$$

$$\textcircled{61} \quad 64t^2 - 16 \quad \text{GCF } 16^+$$

$$16(4t^2 - 1) = \boxed{16(2t+1)(2t-1)}$$

$$\textcircled{63} \quad 3y^2 + 24y + 45 \quad \text{GCF}$$

$$3(y^2 + 8y + 15) = \boxed{3(y+5)(y+3)}$$

4.5

$$\textcircled{9} \quad x^2 + 6x + 8 = 0$$

$$(x+4)(x+2) = 0$$

$$x+4=0$$

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

$$x+2=0$$

$$\underline{-2 \quad -2}$$

$$\boxed{x = -4}$$

$$\boxed{x = -2}$$

$$\textcircled{11} \quad 2x^2 - x = 3 \quad \text{must} = \underline{\text{zero}}$$

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

$$(2x-3)(x+1) = 0$$

$$2x-3=0$$

$$x+1=0$$

$$2x=3$$

$$\boxed{x = -1}$$

$$\boxed{x = \frac{3}{2}}$$

$$\textcircled{13} \quad 2x^2 + 6x = -4 \quad \text{equal } \underline{\text{zero}}$$

$$\frac{2x^2}{2} + \frac{6x}{2} + \frac{4}{2} = 0$$

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

$$(x+2)(x+1) = 0$$

$$x+2=0$$

$$x+1=0$$

$$\boxed{x = -2}$$

$$\boxed{x = -1}$$

4.5 continued

$$(15) \quad x^2 - 4x = 0$$

$$x(x-4) = 0$$

$$\boxed{x=0}$$

$$x-4=0$$

$$\boxed{x=4}$$

$$(17) \quad 2x^2 = 8x$$

$$\frac{2x^2}{2} - \frac{8x}{2} = \frac{0}{2}$$

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

$$x(x-4) = 0$$

$$\boxed{x=0}$$

$$\boxed{x=4}$$

4.6

$$(13) \quad x^2 - 4 = 0$$

$$\frac{x^2 + 4}{+4 \quad +4} = \frac{4}{4}$$

$$\boxed{x = \pm 2}$$

remember

x^2 must have two answers

$$(15) \quad \frac{9x^2}{9} = \frac{25}{9}$$

$$\sqrt{x^2} = \pm \sqrt{\frac{25}{9}}$$

$$\boxed{x = \pm \frac{5}{3}}$$

4.6 continued

$$(17) \quad 5x^2 - 40 = 0$$

$$\frac{5x^2}{5} = \frac{40}{5}$$

$$\sqrt{x^2} = \pm \sqrt{8}$$

$$x = \pm \sqrt{8} = \pm \sqrt{4 \cdot 2} = \boxed{\pm 2\sqrt{2}}$$

4.7

$$(18) \quad x^2 - 5x - 7 = 0 \quad \left(\begin{array}{l} \text{Quad.} \\ \text{Form.} \end{array} \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \right)$$

$$a = 1$$

$$b = -5$$

$$c = -7$$

$$\frac{5 \pm \sqrt{(-5)^2 - 4(1)(-7)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 + 28}}{2} = \boxed{\frac{5 \pm \sqrt{53}}{2}}$$

$$(19) \quad 2x^2 + 5x = 7 \quad \text{must} = \text{zero}$$

$$2x^2 + 5x - 7 = 0$$

$$a = 2$$

$$b = 5$$

$$c = -7$$

$$\frac{-5 \pm \sqrt{(5)^2 - 4(2)(-7)}}{2(2)} =$$

$$\frac{-5 \pm \sqrt{25 + 56}}{4} = \frac{-5 \pm \sqrt{81}}{4} =$$

$$\frac{-5 \pm 9}{4} \quad \frac{-5 + 9}{4} = \frac{4}{4} = \boxed{1} \quad \frac{-5 - 9}{4} = \frac{-14}{4} = \boxed{\frac{-7}{2}}$$

$$\textcircled{15} \quad x^2 + 10x = -25$$

$$x^2 + 10x + 25 = 0$$

$$a = 1$$

$$b = 10$$

$$c = 25$$

$$\frac{-10 \pm \sqrt{10^2 - 4(1)(25)}}{2(1)} =$$

$$\frac{-10 \pm \sqrt{100 - 100}}{2} = \frac{-10 \pm 0}{2} = \frac{-10}{2} = \textcircled{-5}$$

$$\textcircled{17} \quad x^2 = 3x - 1$$

$$x^2 - 3x + 1 = 0$$

$$a = 1$$

$$b = -3$$

$$c = 1$$

$$\frac{3 \pm \sqrt{(-3)^2 - 4(1)(1)}}{2(1)} =$$

$$\frac{3 \pm \sqrt{9 - 4}}{2} = \boxed{\frac{3 \pm \sqrt{5}}{2}}$$

$$\boxed{4.8}$$

$$\textcircled{9} \quad \sqrt{-7} = \sqrt{-1} \sqrt{7} = \boxed{\sqrt{7}i} \text{ or } i\sqrt{7}$$

$$\textcircled{11} \quad \sqrt{-81} = \sqrt{-1} \sqrt{81} = \boxed{9i}$$

$$\textcircled{19} \quad (-3 - 5i) + (4 - 2i) = -3 + 4 - 5i - 2i$$

$$\boxed{1 - 7i}$$

$$\textcircled{21} \quad (12 + 5i) - (2 - i) = 12 + 5i - 2 + i$$

$$= 12 - 2 + 5i + i$$

$$\boxed{10 + 6i}$$

4.8 continued

$$\textcircled{23} (8+i)(2+7i) \text{ Foil}$$

$$16 + 56i + 2i + 7i^2 = -1$$

$$16 + 56i + 2i - 7$$

$$16 - 7 + 56i + 2i = \boxed{9 + 58i}$$

4.9

$\textcircled{55}$ see graph paper
 $<$, $>$ dotted line
 \leq , \geq solid line

use (0,0) as test point

5.1

$$\textcircled{9} 5 - 3x = -3x + 5 \quad \text{degree: linear}$$

terms: binomial

$$\textcircled{11} -x^3 + x^4 + x = x^4 - x^3 + x \quad \text{quartic}$$

trinomial

$$\textcircled{13} 5a^2 + 3a^3 + 1 = 3a^3 + 5a^2 + 1 \quad \text{cubic}$$

trinomial

$$\textcircled{15} 3 + 12x^4 = 12x^4 + 3 \quad \text{quartic}$$

binomial

$$\textcircled{17} \underbrace{7x^3 - 10x^3 + x^3}_{-3x^3 + x^3} = -2x^3$$

cubic
monomial

$$\textcircled{19} x^2 - x^4 + 2x^2$$

$$-x^4 + \underbrace{x^2 + 2x^2}_{3x^2} = -x^4 + 3x^2$$

quartic
binomial

5.2

$$\textcircled{13} \quad y = (x-1)(x+2) \quad a=1 \text{ up}$$

$$x-1=0 \quad x+2=0$$

$$\boxed{x=1} \quad \boxed{x=-2}$$

$$\text{vertex: midpoint} \quad \frac{1+(-2)}{2} = \left(-\frac{1}{2}, -\frac{3}{4}\right)$$

$$(-1.5, 1.5)$$

(see graph paper)

$$\textcircled{15} \quad y = x(x+5)(x-8)$$

$$\boxed{x=0} \quad x+5=0 \quad x-8=0$$

$$\boxed{x=-5} \quad \boxed{x=8}$$

(see graph paper)

$$\textcircled{17} \quad y = (x+1)(x-1)(x-2)$$

$$x+1=0 \quad x-1=0 \quad x-2=0$$

$$\boxed{x=-1} \quad \boxed{x=1} \quad \boxed{x=2}$$

$$\textcircled{23} \quad x = 1, -1, -2$$

$$(x-1)(x+1)(x+2) = f(x)$$

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

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

$$\textcircled{25} \quad x = 0, 0, 2, 3$$

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

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

$$\boxed{f(x) = x^4 - 5x^3 + 6x^2}$$

5.2

33

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

$$2x+3=0$$

$$\begin{array}{r} -3 \quad -3 \\ \hline 2x = -3 \end{array}$$

$$\frac{2x}{2} = \frac{-3}{2}$$

$$x = -\frac{3}{2}$$

$$x-1=0$$

$$x=1 \text{ (multiplicity 2)}$$

5.3

3

$$x^3 + 3x^2 + 4x + 12 \quad \text{4 terms - use grouping}$$

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

Must be
Same

23

$$x^4 + 7x^2 = 18$$

$$x^4 + 7x^2 - 18 = 0$$

$$(x^2+9)(x^2-2) = 0$$

$$x^2+9=0$$

$$x^2-2=0$$

$$\sqrt{x^2} = \pm \sqrt{-9}$$

$$\sqrt{x^2} = \pm \sqrt{2}$$

$$x = \pm 3i$$

$$x = \pm \sqrt{2}$$

27

$$\frac{4x^3}{4} - \frac{8x^2}{4} + \frac{4x}{4} = 0$$

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

$$x(x^2 - 2x + 1) = 0$$

$$x(x-1)(x-1) = 0$$

$$x=0, x=1$$

(2 multiplicity 2)

5.4

$$(21) \quad (x^3 + 3x^2 - x - 3) \div (x-1)$$

$$x-1=0$$

 $x=1$ (outside box)

$$\begin{array}{r|rrrr} & x^3 & x^2 & x^1 & c \\ 1 & 1 & 3 & -1 & -3 \\ & \downarrow +1 & +4 & +3 & \\ \hline & 1 & 4 & 3 & 0 \end{array}$$

$$\begin{array}{l} x^2 \\ x \\ c \\ r \end{array} = \boxed{x^2 + 4x + 3}$$

$$(23) \quad (x^3 - 7x^2 - 7x + 20) \div (x+4)$$

$$x+4=0 \quad x=-4$$

$$\begin{array}{r|rrrr} -4 & x^3 & x^2 & x^1 & c \\ & 1 & -7 & -7 & 20 \\ & \downarrow +4 & +44 & -148 & \\ \hline & 1 & -11 & 37 & -128 \end{array}$$

$$\begin{array}{l} x^2 \\ x \\ c \\ r \end{array}$$

$$= \boxed{x^2 - 11x + 37 - \frac{128}{x+4}}$$

5.5

$$(15) \quad \frac{p}{q} = \frac{10}{7} = \frac{1, 2, 5, 10}{1, 7} = \begin{array}{l} \pm 1, \pm 2, \pm 5, \pm 10 \\ \pm \frac{1}{7}, \pm \frac{2}{7}, \pm \frac{5}{7}, \pm \frac{10}{7} \end{array} \quad \text{16 total}$$

$$(17) \quad \frac{p}{q} = \frac{10}{10} = \frac{1, 2, 5, 10}{1, 2, 5, 10} = \begin{array}{l} \pm 1, \pm 2, \pm 5, \pm 10 \\ \pm \frac{1}{2}, \pm \frac{5}{2} \\ \pm \frac{1}{5}, \pm \frac{2}{5} \\ \pm \frac{1}{10} \end{array} \quad \text{18 total}$$

Concept Byte

(1) $(2a^3)(5a^4) = 10a^7$
 (3) $(3x^2y^3)^2 = 3^2(x^2)^2(y^3)^2$

(5) $\frac{4a^8}{2a^4} = \frac{4}{2} \frac{a^8}{a^4} = 2a^4$

(13) $\frac{r^2s^4t^6}{r^3s^4t^{-6}} = \frac{r^2}{r^3} \frac{s^4}{s^4} \frac{t^6}{t^{-6}} = \frac{t^{12}}{r}$

6.1

(27) $\sqrt[3]{27y^6} = \sqrt[3]{27} \sqrt[3]{y^6} = 3y^2$
 $y^{6/3=2}$

(29) $\sqrt[5]{32y^{10}} = \sqrt[5]{32} \sqrt[5]{y^{10}} = 2y^2$
 $y^{10/5=2}$

6.2

(19) $\sqrt{20x^3} = \sqrt{20} \sqrt{x^3} = 2\sqrt{5} \times x^{3/2} = 2\sqrt{5} \times \sqrt{x} = 2x\sqrt{5x}$
 $x^{3/2} = 1\frac{1}{2}$

(21) $\sqrt{50x^5} = \sqrt{50} \sqrt{x^5} = 5\sqrt{2} \times x^{5/2} = 5\sqrt{2} \times x^2 \sqrt{x} = 5x^2\sqrt{2x}$
 $x^{5/2} = 2\frac{1}{2}$

6.2

$$\textcircled{23} \quad \sqrt[3]{54y^{10}} = \sqrt[3]{54} \sqrt[3]{y^{10}} = \sqrt[3]{27} \sqrt[3]{2} y^{10/3} = 3 \sqrt[3]{2} y^3 \sqrt[3]{y} = \boxed{3y^3 \sqrt[3]{2y}}$$

$$\textcircled{25} \quad \sqrt[3]{-250x^6y^5} = \sqrt[3]{-250} \sqrt[3]{x^6} \sqrt[3]{y^5} = \sqrt[3]{-125} \sqrt[3]{2} x^{6/3} y^{5/3} = -5 \sqrt[3]{2} x^2 y \sqrt[3]{y^2} = \boxed{-5x^2y \sqrt[3]{2y^2}}$$

$$\textcircled{27} \quad \sqrt[5]{-32x^6y^7} = \sqrt[5]{-32} \sqrt[5]{x^6} \sqrt[5]{y^7} = -2 x^{6/5} y^{7/5} = -2 x \sqrt[5]{x} y \sqrt[5]{y^2} = \boxed{-2xy \sqrt[5]{xy^2}}$$

6.3

$$\textcircled{17} \quad 6\sqrt{18} + 3\sqrt{50} \text{ simplify 1st}$$

$$6\sqrt{9\sqrt{2}} + 3\sqrt{25\sqrt{2}}$$

$$6(3)\sqrt{2} + 3(5)\sqrt{2} = 18\sqrt{2} + 15\sqrt{2} = \boxed{33\sqrt{2}}$$

$$\textcircled{19} \quad \sqrt{18} + \sqrt{32}$$

$$\sqrt{9\sqrt{2}} + \sqrt{16\sqrt{2}} =$$

$$3\sqrt{2} + 4\sqrt{2} = \boxed{7\sqrt{2}}$$

$$\textcircled{29} \quad (5 - \sqrt{11})(5 + \sqrt{11}) \text{ FOIL}$$

$$25 + 5\sqrt{11} - 5\sqrt{11} - 11 = \boxed{14}$$

6.4

* remember: $\frac{\text{exponent}}{\text{index}}$

(27)

$$\sqrt{-10} = (-10)^{1/2}$$

(29)

$$\sqrt{(7x)^3} = (7x)^{3/2}$$

(31)

$$\sqrt[3]{a^2} = a^{2/3}$$

(33)

$$\sqrt[4]{c^2} = c^{2/4} = c^{1/2}$$

(55)

$$(x^{2/3})^{-3} = x^{-2} = \frac{1}{x^2}$$

(59)

$$(-27x^{-9})^{1/3} = (-27)^{1/3} (x^{-9})^{1/3}$$

$$-3 x^{-3} = \frac{-3}{x^3}$$

(61)

$$(x^{1/2} y^{-2/3})^{-6} = (x^{1/2})^{-6} (y^{-2/3})^{-6}$$

$$x^{-3} y^4 = \frac{y^4}{x^3}$$

Mid-Ch Quiz

(5)

$$\sqrt{50x^4y^8} = \sqrt{50} \sqrt{x^4} \sqrt{y^8}$$

$$\sqrt{25} \sqrt{2} x^{4/2=2} y^{8/2=4}$$

$$\boxed{5x^2y^4\sqrt{2}}$$

6.5

(13)

$$(\sqrt{2x-1})^2 = (3)^2$$

$$2x-1 = 9$$

$$\begin{array}{r} +1 \quad +1 \\ \hline 2x = 10 \end{array}$$

$$\frac{2x}{2} = \frac{10}{2}$$

$$\boxed{x=5}$$

$$\textcircled{15} \quad (\sqrt{3x+4})^2 = (4)^2$$

$$3x+4 = 16$$

$$3x = 12$$

$$x = 4$$

$$\textcircled{19} \quad [(x+2)^{2/3}]^{3/2} = (9)^{3/2} \rightarrow \text{need to add } \pm \text{ (even index)}$$

$$x+2 = \pm 9^{3/2}$$

$$x+2 = \pm 27$$

$$x = -2 \pm 27$$

$$-2 + 27 = 25$$

$$-2 - 27 = -29$$

~~$$\textcircled{21} \quad (x+1)^{3/2} - 2 = 25$$

$$x+1 = 9$$

$$x = 8$$~~

wrong problem!

$$\textcircled{21} \quad \frac{3(x+3)^{3/4}}{3} = \frac{81}{3}$$

$$[(x+3)^{3/4}]^{4/3} = (27)^{4/3}$$

$$x+3 = 81$$

$$x = 78$$

$$\textcircled{23} \quad \frac{3}{-3} + (4-x)^{3/2} = 11$$

$$[(4-x)^{3/2}]^{2/3} = (8)^{2/3}$$

$$4-x = 4$$

$$-x = 0$$

$$x = 0$$

6.5

29

$$\sqrt{11x+3} - 2x = 0$$

$$(\sqrt{11x+3})^2 = (2x)^2$$

$$11x+3 = 4x^2$$

$$0 = 4x^2 - 11x - 3$$

$$0 = (4x + 1)(x - 3)$$

$$4x + 1 = 0$$

$$4x = -1$$

$$x = -\frac{1}{4}$$

$$x - 3 = 0$$

$$x = 3$$

only solution

check
denominator = 0

31

$$\sqrt{3x+13} - 5 = x$$

$$(\sqrt{3x+13})^2 = (x+5)^2 \quad \underline{\text{FOIL}}$$

$$\begin{array}{r} 3x+13 = x^2+10x+25 \\ -3x \quad -13 \quad \quad -3x \quad -13 \end{array}$$

$$0 = x^2 + 7x + 12$$

$$0 = (x+4)(x+3)$$

$$x = -4, x = -3$$

6.6

21

$$(f+g)(x) = (2x^2+x-3) + (x-1) =$$

$$2x^2 + 2x - 4 \quad D: \mathbb{R}$$

23

$$(g-f)(x) = (x-1) - (2x^2+x-3)$$

$$x-1-2x^2-x+3 =$$

$$-2x^2 + 2 \quad D: \mathbb{R}$$

6.6

(27) $(h \circ g)(1)$ Do $g(1)$ 1st

$$g(1) = 2(1) = 2$$

use that value in h

$$2^2 + 4 = 4 + 4 = \textcircled{8}$$

(29) $(h \circ g)(-2)$

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

$$h(-4) = (-4)^2 + 4 = 16 + 4 = \textcircled{20}$$

(37) $(f \circ g)(-2)$

$$g(-2) = -2 - 3 = -5$$

$$f(-5) = (-5)^2 = \textcircled{25}$$

6.7

(13) $y = 2x - 1$
 $x = 2y - 1$

$$\frac{x+1}{2} = \frac{2y}{2}$$

① switch $x+y$ ② solve for y

$$\frac{1}{2}x + \frac{1}{2} = y^{-1} \quad \text{yes, it is a function}$$

(21) $y = 2x - 3$

linear

$$b = -3$$

$$m = \frac{2}{1} \uparrow$$

(see graph
paper)

$$x = 2y - 3$$

$$\frac{x+3}{2} = \frac{2y}{2}$$

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

linear

$$b = \frac{3}{2} \quad m = \frac{1}{2} \uparrow$$

6.8

⑦ $y = \sqrt{x} + 1$ $h: 0$ $k: 1$ ↑ up

$y = \sqrt{x}$ $\begin{array}{c|c|c|c|c} x & 0 & 1 & 4 & 9 \\ \hline y & 0 & 1 & 2 & 3 \end{array}$ (see graph)

⑨ $y = \sqrt{x} - 4$ $h: 0$
Same points as #7 but $k: -4$ ↓ down

⑩ $y = \sqrt{x} - 3$ $k: 0$ see graphs

Same points as #7 but $h: 3$ ⇒ right

⑬ $y = \sqrt{x} + 6$ $k: 0$
Same points as #7 but $h: -6$ ← left

⑳ $y = \sqrt[3]{x} + 5$ $h: -5$ ← left
 $k: 0$

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

㉓ $y = \sqrt[3]{x} + 2 - 7$

Same pts as #25 $h: -2$ ← left
 $k: -7$ ↓ down

7.1

$$(19) f(x) = 2(0.65)^x$$

$$\text{decay } a = 2 \quad 2 > 0$$

$$b = 0.65 \quad 0 < 0.65 < 1$$

y-int - plug in zero for x

$$f(x) = 2(0.65)^0 = 2(1) = 2 \quad (0, 2)$$

$$(21) y = 0.8 \left(\frac{1}{8}\right)^x$$

$$\text{decay } a = 0.8 \quad 0.8 > 0$$

$$b = \frac{1}{8} \quad 0 < \frac{1}{8} < 1$$

$$y\text{-int: } 0.8 \left(\frac{1}{8}\right)^0 = 0.8(1) = 0.8 \quad (0, 0.8)$$

$$(23) y = 0.45(3)^x$$

$$\text{growth } a = 0.45 \quad 0.45 > 0$$

$$b = 3 \quad 3 > 1$$

$$y\text{-int } 0.45(3)^0 = 0.45(1) = 0.45 \quad (0, 0.45)$$

$$(25) f(x) = 2^{-x} = \left(\frac{1}{2}\right)^x$$

$$\text{decay } a = 2 \quad 2 > 0$$

$$b = \frac{1}{2} \quad 0 < \frac{1}{2} < 1$$

$$y\text{-int} = \left(\frac{1}{2}\right)^0 = 1 \quad (0, 1)$$

$$(27) y = a(1+r)^t$$

$$y = 120,000(1+0.012)^t$$

$$y = 120,000(1.012)^t$$

$$y = 120,000(1.012)^{15} = 143,512 \text{ people}$$

7.2

$$\begin{aligned} \textcircled{29} \quad A &= Pe^{rt} \\ A &= 400e^{(0.076)(1.5)} \\ A &\approx \boxed{\$ 448.30} \end{aligned}$$

7.3

$$\textcircled{13} \quad 10^3 = 1000 \quad * \log_b y = x$$

$$\boxed{\log 1000 = 3}$$

$$\textcircled{15} \quad \frac{1}{10} = 10^{-1} \quad \boxed{\log \frac{1}{10} = -1}$$

$$\textcircled{17} \quad 4 = \left(\frac{1}{2}\right)^{-2} \quad \boxed{\log_{\frac{1}{2}} 4 = -2}$$

$$\left(\frac{1}{2}\right)^{-2} = 4$$

$$\textcircled{19} \quad 10^{-2} = 0.01 \quad \boxed{\log 0.01 = -2}$$

$$\textcircled{21} \quad \log_4 2 \quad \begin{aligned} 4^x &= 2 \\ 2^{2x} &= 2^1 \end{aligned} \quad \begin{aligned} 2x &= 1 \\ x &= \frac{1}{2} \end{aligned}$$

$$\textcircled{23} \quad \log_4 8 \quad \begin{aligned} 4^x &= 8 \\ 2^{2x} &= 2^3 \end{aligned} \quad \begin{aligned} 2x &= 3 \\ x &= \frac{3}{2} \end{aligned}$$

$$\textcircled{25} \quad \log_{49} 7 \quad \begin{aligned} 49^x &= 7 \\ 7^{2x} &= 7^1 \end{aligned} \quad \begin{aligned} 2x &= 1 \\ x &= \frac{1}{2} \end{aligned}$$

$$\textcircled{27} \quad \log_3 9 \quad \begin{aligned} 3^x &= 9 \\ x &= 2 \end{aligned}$$

$$\textcircled{31} \quad \log_5 125 \quad \begin{aligned} 5^x &= 125 \\ x &= 3 \end{aligned}$$

7.4

$$\textcircled{9} \quad \log 7 + \log 2 = \log (7 \cdot 2) = \boxed{\log 14}$$

$$\begin{aligned} \textcircled{11} \quad 5 \log 3 + \log 4 &= \log 3^5 + \log 4 \\ &= \log 243 + \log 4 \\ &= \log 243(4) = \boxed{\log 972} \end{aligned}$$

$$\textcircled{13} \quad 4 \log m - \log n = \log m^4 - \log n = \boxed{\log \frac{m^4}{n}}$$

$$\textcircled{15} \quad \log_6 5 + \log_6 x = \boxed{\log_6 5x}$$

$$\begin{aligned} \textcircled{17} \quad \log_3 4 + \log_3 y + \log_3 8x \\ \log_3 4y + \log_3 8x = \boxed{\log_3 32xy} \end{aligned}$$

$$\textcircled{19} \quad \log_7 49xyz = \log_7 49 + \log_7 x + \log_7 y + \log_7 z = \boxed{2 + \log_7 x + \log_7 y + \log_7 z}$$

$$\textcircled{21} \quad \log a^2 = \boxed{2 \log a}$$

$$\begin{aligned} \textcircled{23} \quad \log_3 (2x)^2 &= \log_3 4x^2 = \log_3 4 + \log_3 x^2 \\ &= \boxed{\log_3 4 + 2 \log_3 x} \end{aligned}$$

$$\begin{aligned} \textcircled{25} \quad \log \frac{a^2 b^3}{c^4} &= \log a^2 b^3 - \log c^4 \\ &= \log a^2 + \log b^3 - \log c^4 \\ &= \boxed{2 \log a + 3 \log b - 4 \log c} \end{aligned}$$

7.5

$$\textcircled{7} \quad \begin{array}{l} 2^x = 8 \\ 2^x = 2^3 \end{array} \quad \boxed{x=3}$$

$$\textcircled{9} \quad \begin{array}{l} 4^{3x} = 64 \\ 4^{3x} = 4^3 \end{array} \quad \boxed{x=1}$$

$$3x = 3$$

$$\textcircled{11} \quad \begin{array}{l} 2^{5x+1} = 32 \\ 2^{5x+1} = 2^5 \\ 5x+1 = 5 \\ 5x = 4 \end{array} \quad \boxed{x = \frac{4}{5}}$$

$$\textcircled{13} \quad \begin{array}{l} 2^{3x} = 2^{2(x+1)} \\ 3x = 2x + 2 \\ \frac{-2x}{-2x} \quad \frac{-2x}{-2x} \\ \hline \boxed{x=2} \end{array}$$

$$\textcircled{21} \quad \begin{array}{l} 25^{2x+1} = 144 \\ \log_{25} 25^{2x+1} = \log_{25} 144 \end{array}$$

$$2x+1 = \left(\frac{\log 144}{\log 25} - 1 \right) \div 2$$

then $\div 2$

* round once
at very
end *

$$\boxed{x \approx 0.2720}$$

$$\textcircled{69} \quad \log_8 (2x-1) = \frac{1}{3} \quad \text{switch to exponential}$$

$$8^{1/3} = 2x-1$$

$$\begin{array}{l} 2 = 2x-1 \\ +1 \quad \quad +1 \end{array}$$

$$\frac{3}{2} = \frac{2x}{2}$$

$$\boxed{x = \frac{3}{2}}$$

Ch 7 Chapter Review

⑨ $y = 3(0.25)^x$

decay $a=3$ $3 > 0$

$b=0.25$ $0 < 0.25 < 1$

y-int $3(0.25)^0 = 3(1) = 3$ (0, 3)

⑭ $y = a(1-r)^t$

$y = 12,500(1-0.09)^t$

$y = 12,500(0.91)^t$ 5 years

$y = 12,500(0.91)^5$

$y \approx \$7800$

⑮ $y = a(1+r)^t$

$y = 50(1+0.03)^t$

$y = 50(1.03)^t$ 5 years

$y = 50(1.03)^5$

$y \approx \$58$

8.2 - on graph paper

8.4

③ $\frac{(x+5)(\cancel{x-2})}{(x+6)(\cancel{x-2})} \cdot \frac{3(x+6)}{x+3} = \frac{3(x+5)}{x+3}$

$x \neq -6, 2, -3$

p. 4

$$\textcircled{33} \frac{2x(x-3)}{(x+9)(x+9)} \cdot \frac{9(x+9)}{(x+3)(x-3)} = \frac{18x}{(x+9)(x+3)}$$

$$x \neq -9, -3, 3$$

$$\textcircled{50} \text{ Zeros: } -4, -1, 2$$

$$y = (x+4)(x+1)(x-2) \quad \textcircled{D}$$

p. 5

$$\textcircled{32} \frac{3}{x+1} = \frac{3(x-1)}{(x+1)(x-1)} = \frac{3x-3}{(x+1)(x-1)}$$

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

$$\frac{x^2+4x-3}{(x+1)(x-1)} \quad x \neq 1, -1$$

p. 6

$$\textcircled{45} \left[\frac{1}{b+1} + \frac{1}{b-1} = \frac{2}{(b+1)(b-1)} \right] \quad (b+1)(b-1)$$

$$1(b-1) + 1(b+1) = 2$$

$$-b-1 + b+1 = 2$$

$$\frac{2b}{2} = \frac{2}{2}$$

$$b = 1$$

No Solution

Check!

can't = 0 in denominator

Ch 8 Test

$$(21) \quad \frac{3}{x-1} = \frac{4}{3x+2} \quad \text{Cross multiply}$$

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

$$\begin{array}{r} 9x+6 = 4x-4 \\ -4x \quad -4x \\ \hline \end{array}$$

$$\begin{array}{r} 5x+6 = -4 \\ -6 \quad -6 \\ \hline \end{array}$$

$$\frac{5x}{5} = \frac{-10}{5}$$

$$\boxed{x = -2}$$