

FINAL REVIEW KEY

1. $\boxed{B} \rightarrow B$ is CUBIC

2. $-8x^2 + 120x + 432 = 0$

$$-8(x^2 - 15x - 54) = 0$$

$$x^2 - 15x - 54 = 0$$

$$(x - 18)(x + 3) = 0$$

$$\boxed{x = 18, -3}$$

* solved by FACTORING

\Rightarrow also could have:

- COMPLETED THE SQUARE
- used QUADR. FORMULA

3. $-5x^2 + 55x = 50$

$$-5x^2 + 55x - 50 = 0$$

$$-5(x^2 - 11x + 10) = 0$$

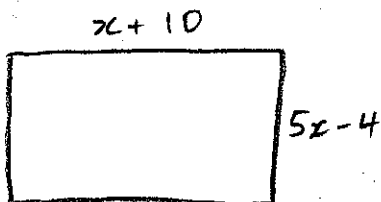
$$x^2 - 11x + 10 = 0$$

$$(x - 10)(x - 1) = 0$$

$$\boxed{x = 10, 1}$$

* SAME \uparrow

4.



$$A = lw$$

$$72 = (x+10)(5x-4)$$

$$5x^2 + 46x - 40 = 72$$

$$5x^2 + 46x - 112 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-46 \pm \sqrt{46^2 - 4(5)(-112)}}{10}$$

$$x = \frac{-46 \pm 66}{10} = \boxed{2, -11.2}$$

cannot have negative dimensions!

$$5. (x+1)^2 = 43$$

$$\sqrt{(x+1)^2} = \sqrt{43}$$

$$x+1 = \pm \sqrt{43}$$

$$\boxed{x = -1 \pm \sqrt{43}}$$

$$6. y = -\frac{1}{2}x^2 - 2x + \frac{7}{10} \quad (\text{set } y = 0)$$

$$0 = -\frac{1}{2}(x^2 + 4x - \frac{7}{5})$$

$$0 = x^2 + 4x - \frac{7}{5}$$

$$0 = 5x^2 + 20x - 7$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-20 \pm \sqrt{20^2 - 4(5)(-7)}}{10}$$

$$x = \frac{-20 \pm \sqrt{540}}{10}$$

$$x = \frac{-20 \pm 6\sqrt{15}}{10}$$

$$x = \frac{-10 \pm 3\sqrt{15}}{5}$$

OR

$$-2 \pm \frac{3\sqrt{15}}{5}$$

$$7. y = 5x^2 + 20x - 6 \quad (\text{set } y = 0)$$

$$6 = 5x^2 + 20x \quad \boxed{+2} \text{ } \textcircled{4}$$

$$6 = 5(x^2 + 4x)$$

$$6 + 20 = 5(x^2 + 4x + 4)$$

$$26 = 5(x+2)^2$$

$$(x+2)^2 = \frac{26}{5}$$

$$x+2 = \pm \frac{\sqrt{26}}{\sqrt{5}}$$

$$x+2 = \pm \frac{\sqrt{130}}{5}$$

$$\boxed{x = \pm \frac{\sqrt{130} - 10}{5}}$$

$$8. \quad x^2 + 4x - 21 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(-21)}}{2}$$

$$x = \frac{-4 \pm \sqrt{100}}{2} = \frac{-4 \pm 10}{2} = \boxed{3, -7}$$

$$9. \quad 3x^2 = 8x - 4 \Rightarrow \boxed{3x^2 - 8x + 4 = 0}$$

$$a) \quad 3x^2 - 8x + 4 = 0$$

$$\frac{x}{12} \frac{+}{-8} \\ -6 \cdot 2$$

$$3x^2 - 6x - 2x + 4 = 0$$

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

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

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

$$b) \quad 3x^2 - 8x + 4 = 0$$

$$3x^2 - 8x = -4$$

$$3\left(x^2 - \frac{8}{3}x\right) = -4$$

$$3\left(x^2 - \frac{8}{3}x + \frac{16}{9}\right) = -4 + \frac{16}{3}$$

$$3\left(x - \frac{4}{3}\right)^2 = \frac{4}{3}$$

$$\sqrt{\left(x - \frac{4}{3}\right)^2} = \sqrt{\frac{4}{9}}$$

$$x - \frac{4}{3} = \pm \frac{2}{3}$$

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

$$\left[-\frac{4}{3}, \frac{16}{9}\right]$$

$$c) \quad 3x^2 - 8x + 4 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(3)(4)}}{6}$$

$$x = \frac{8 \pm \sqrt{16}}{6}$$

$$x = \frac{8 \pm 4}{6} = \boxed{2, \frac{2}{3}}$$

$$10. \quad y = 3x^2 - 10x + 6 \quad (\text{set } y = 0)$$

$$3x^2 - 10x + 6 = 0$$

$$\frac{x}{18} \pm \frac{-10}{6}$$

cannot factor.

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(3)(6)}}{6}$$

$$x = \frac{10 \pm \sqrt{28}}{6}$$

$$x = \frac{10 \pm 2\sqrt{7}}{6} = \boxed{\frac{5 \pm \sqrt{7}}{3}}$$

$$11. \quad a) \quad x^2 + 10x - 24$$

$$= \boxed{(x+12)(x-2)}$$

$$b) \quad 2x^2 - 8x + 6$$

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

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

$$c) \quad -x^2 - 15x - 44$$

$$= -1(x^2 + 15x + 44)$$

$$= \boxed{-1(x+11)(x+4)}$$

$$d) \quad 3x^2 - 21x$$

$$= \boxed{3x(x-7)}$$

$$e) \quad 6x^2 + 17x - 3$$

$$= 6x^2 + 18x - 1x - 3$$

$$= 6x(x+3) - 1(x+3)$$

$$= \boxed{(x+3)(6x-1)}$$

$$f) \quad 8x^2 + x - 9$$

$$= 8x^2 + 8x + 9x - 9$$

$$= 8x(x-1) + 9(x-1)$$

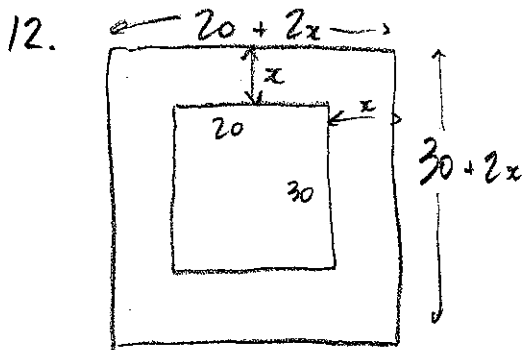
$$= \boxed{(x-1)(8x+9)}$$

$$g) \quad x^2 - 9$$

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

$$h) \quad 4x^2 + 25$$

$$= \boxed{4x^2 + 25}$$



$$A(\text{photo}) = 20 \times 30 = 600 \text{ cm}^2$$

$$A(\text{border}) = 4(600) = 2400 \text{ cm}^2$$

$$A(\text{whole thing}) = 3000 \text{ cm}^2$$

$$A = lw$$

$$3000 = (30 + 2x)(20 + 2x)$$

$$3000 = 600 + 100x + 4x^2$$

$$4x^2 + 100x - 2400 = 0$$

$$x^2 + 25x - 600 = 0$$

$$(x + 40)(x - 15) = 0$$

$$x = -40 \quad x = 15$$

$$w = 20 + 2(15)$$

$$w = 50 \text{ cm}$$

$$l = 30 + 2(15)$$

$$l = 60 \text{ cm}$$

13. $2l + 2w = 202 \Rightarrow l + w = 101$

$$lw = 2170$$

$$l = 101 - w$$

$$(101 - w)(w) = 2170$$

$$-w^2 + 101w = 2170$$

$$w^2 - 101w + 2170 = 0$$

$$w = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{101 \pm \sqrt{(-101)^2 - 4(1)(2170)}}{2}$$

$$= \frac{101 \pm 39}{2} = 70, 31$$

$$\text{so } l = 31, 70$$

$$31 \times 70$$

$$\text{m} \quad \text{m}$$

14. let $2x+1 = \text{ODD INTEGER}$

$$(2x+1)^2 + (2x+3)^2 = 1570$$

$$4x^2 + 4x + 1 + 4x^2 + 12x + 9 = 1570$$

$$8x^2 + 16x + 10 = 1570$$

$$8x^2 + 16x - 1560 = 0$$

$$x^2 + 2x - 195 = 0$$

$$(x+15)(x-13) = 0$$

$$x = -15, 13$$

$$2x+1 = -29 \text{ or } 27$$

$$2x+3 = -27 \text{ or } 29$$

15. let $x = \text{avg. speed of Wpg. to Billings}$
let $x+5 = \text{avg. speed back.}$

$$t = \frac{d}{s}$$

$$31 = \underbrace{\frac{1200}{x}}_{\text{time there}} + \underbrace{\frac{1200}{x+5}}_{\text{time back.}}$$

$$31(x)(x+5) = 1200(x+5) + 1200(x)$$

$$31x^2 + 155x = 1200x + 6000 + 1200x$$

$$31x^2 - 2245x - 6000 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{2245 \pm \sqrt{(-2245)^2 - 4(31)(-6000)}}{62}$$

$$x = \frac{2245 \pm 2405}{62} = 75 \text{ or } -6$$

$$x = 75 \text{ km/hr.}$$
$$x+5 = 80 \text{ km/hr.}$$

16. let s = speed in still water
let c = current speed = 2 km/h.

$$t = \frac{d}{s}$$

$$t = \frac{d(\text{upriver})}{s - c} + \frac{d(\text{downriver})}{s + c}$$

$$2.5 = \frac{12}{s - 2} + \frac{12}{s + 2}$$

$$2.5(s - 2)(s + 2) = 12(s + 2) + 12(s - 2)$$

$$2.5s^2 - 10 = 12s + 24 + 12s - 24$$

$$2.5s^2 - 24s - 10 = 0$$

$$10s^2 - 96s - 40 = 0$$

$$10s^2 + 4s - 100s - 40 = 0$$

$$2s(5s + 2) - 20(5s + 2) = 0$$

$$(5s + 2)(2s - 20) = 0$$

$$s = \frac{-2}{5}, \quad \frac{20}{2} = \boxed{10}$$

17.

a) i) $V = (0, 0)$

ii) $x = 0$

iii) $D: x \in \mathbb{R}$

$R: y \leq 0$

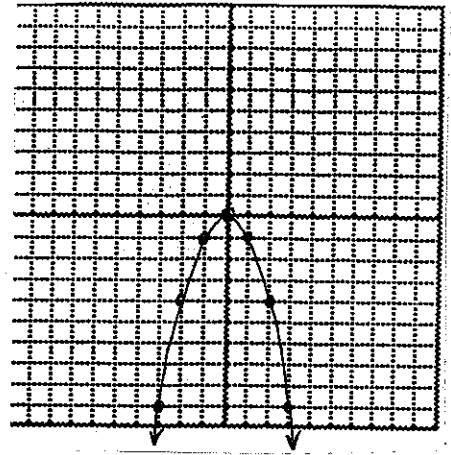
iv) MAX @ $y = 0$

v) x -ints: $0 = -x^2$

$x = 0$
 $(0, 0)$

y -int: $y = -(0)^2$

$y = 0$
 $(0, 0)$



b) i) $V = (0, -6)$

ii) $x = 0$

iii) $D: x \in \mathbb{R}$

$R: y \geq -6$

iv) MIN @ $y = -6$

v) x -ints: $0 = 2x^2 - 6$

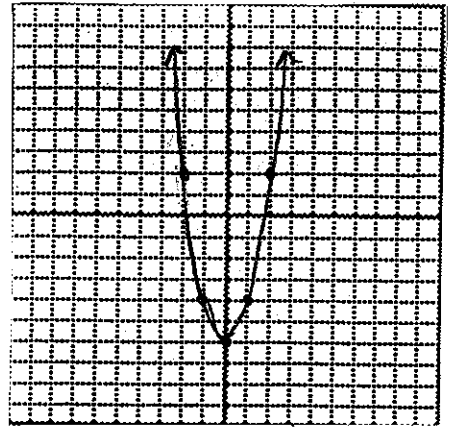
$6 = 2x^2$

$x^2 = 3$

$x = \pm \sqrt{3}$

y -int: $y = 2(0)^2 - 6$

$y = -6$
 $(0, -6)$



c) i) $V = (1, 2)$

ii) $x = 1$

iii) $D: x \in \mathbb{R}$

$R: y \geq 2$

iv) MIN @ $y = 2$

v) x -ints:

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

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

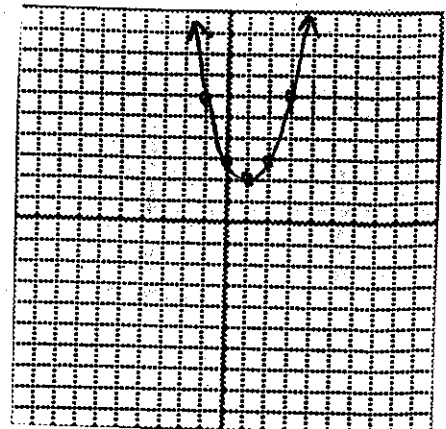
no x -ints

y -int:

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

$y = 1 + 2$

$y = 3$
 $(0, 3)$



d) i) $V = (-5, 2)$

ii) $x = -5$

iii) $D: x \in \mathbb{R}$

$R: y \leq 2$

iv) MAX @ $y = 2$

v) x-ints:

$$0 = -\frac{1}{2}(x+5)^2 + 2$$

$$-2 = -\frac{1}{2}(x+5)^2$$

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

$$x+5 = \pm 2$$

$$x = -3, -7$$

$$\boxed{(-3, 0), (-7, 0)}$$

y-int:

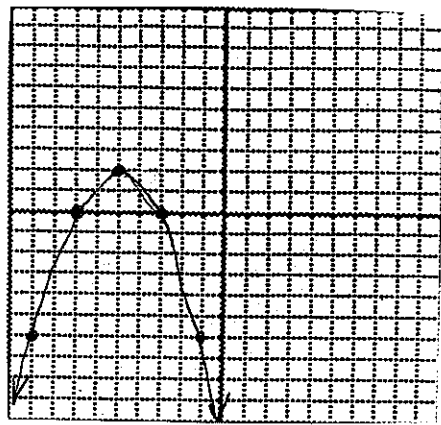
$$y = -\frac{1}{2}(0+5)^2 + 2$$

$$y = -\frac{1}{2}(25) + 2$$

$$y = -\frac{25}{2} + \frac{4}{2}$$

$$y = -\frac{21}{2}$$

$$\boxed{\left(0, -\frac{21}{2}\right)}$$



e) i) $V = (-2, -8)$

ii) $x = -2$

iii) $D: x \in \mathbb{R}$

$R: y \geq -8$

iv) MIN @ $y = -8$

v) x-ints:

$$0 = 3(x+2)^2 - 8$$

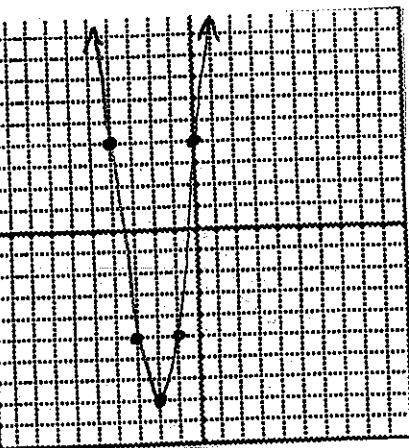
$$8 = 3(x+2)^2$$

$$\frac{8}{3} = (x+2)^2$$

$$x+2 = \pm \frac{2\sqrt{2}}{\sqrt{3}}$$

$$x + \frac{6}{2} = \pm \frac{2\sqrt{6}}{3}$$

$$\boxed{x = \frac{-6 \pm 2\sqrt{6}}{3}}$$



y-int: $y = 3(0+2)^2 - 8$

$$y = 3(4) - 8$$

$$y = 4$$

$$\boxed{(0, 4)}$$

$$18) a) V = (-1, 4)$$

$$P = (-2, 2)$$

$$y = a(x-h)^2 + k$$

$$2 = a(-2+1)^2 + 4$$

$$2 = a + 4$$

$$a = -2$$

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

$$b) V = (-2, 3)$$

$$y\text{-int} = -1, \text{ so } P = (0, -1)$$

$$y = a(x-h)^2 + k$$

$$-1 = a(0+2)^2 + 3$$

$$-1 = 4a + 3$$

$$-4 = 4a$$

$$a = -1$$

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

$$c) P_1 = (-3, 4) \quad P_2 = (6, 6) \quad P_3 = (5, 4)$$

P_1 and P_3 are symmetrical, so average

-3 and $5 \Rightarrow \underline{\underline{1}} \Rightarrow x\text{-value of vertex.}$

$$P_2 = (6, 6)$$

$$V = (1, k)$$

$$y = a(x-h)^2 + k$$

$$6 = a(6-1)^2 + k$$

$$6 = 25a + k$$

$$k = 6 - 25a$$

use P_3 :

$$y = a(x-h)^2 + k$$

$$4 = a(5-1)^2 + (6-25a)$$

$$4 = 16a - 25a + 6$$

$$-2 = -9a$$

$$a = \frac{2}{9}$$

$$k = 6 - 25\left(\frac{2}{9}\right)$$

$$= \frac{54}{9} - \frac{50}{9} = \frac{4}{9}$$

$$y = \frac{2}{9}(x-1)^2 + \frac{4}{9}$$

$$19. a) y = x^2 - 2x + 3 \quad \boxed{-1} \textcircled{1}$$

$$y - 3 = x^2 - 2x$$

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

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

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

$$b) y = -x^2 + 8x - 12$$

$$\boxed{-4} \textcircled{16}$$

$$y + 12 = -1(x^2 - 8x)$$

$$y + 12 - 16 = -1(x^2 - 8x + 16)$$

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

$$\boxed{y = -(x - 4)^2 + 4}$$

$$c) y = 3x - x^2$$

$$y = -1(x^2 - 3x) \quad \boxed{-\frac{3}{2}} \textcircled{\frac{9}{4}}$$

$$y - \frac{9}{4} = -1(x^2 - 3x + \frac{9}{4})$$

$$\boxed{y = -(x - \frac{3}{2})^2 + \frac{9}{4}}$$

$$d) y = 2x^2 + 8x + 6$$

$$\boxed{2} \textcircled{4}$$

$$y - 6 = 2(x^2 + 4x)$$

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

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

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

$$e) y = -\frac{1}{3}x^2 + 2x + 4 \quad \boxed{-3} \quad \textcircled{9}$$

$$y - 4 = -\frac{1}{3}(x^2 - 6x)$$

$$y - 4 - 3 = -\frac{1}{3}(x^2 - 6x + 9)$$

$$y - 7 = -\frac{1}{3}(x - 3)^2$$

$$\boxed{y = -\frac{1}{3}(x - 3)^2 + 7}$$

$$20. x - y = 10 \Rightarrow x = 10 + y$$

$$P = xy$$

$$P = (10 + y)(y)$$

$$P = y^2 + 10y \quad \boxed{5} \quad \textcircled{25}$$

$$P + 25 = y^2 + 10y + 25$$

$$P = (y + 5)^2 - 25$$

$$\begin{aligned} y &= -5 \\ x &= 5 \\ P &= -25 \end{aligned}$$

$$21. x + y = 34 \Rightarrow y = 34 - x$$

$$S = x^2 + y^2$$

$$S = x^2 + (34 - x)^2$$

$$S = x^2 + x^2 - 68x + 1156$$

$$S = 2x^2 - 68x + 1156 \quad \boxed{-17} \quad \textcircled{289}$$

$$S - 1156 = 2(x^2 - 34x)$$

$$S - 1156 + 578 = 2(x^2 - 34x + 289)$$

$$S = 2(x - 17)^2 + 578$$

$$\begin{aligned} x &= 17 \\ y &= 17 \\ S &= 578 \end{aligned}$$

22. $h(d) = -1.17d^2 + 3$ ← STANDARD FORM! yay!

a) max height is when $d = 0$

$$h(0) = \boxed{3 \text{ m}}$$

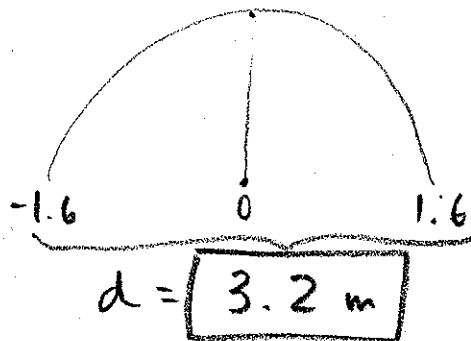
b) ends have $h(d) = 0$

$$0 = -1.17d^2 + 3$$

$$1.17d^2 = 3$$

$$d^2 = 2.5641$$

$$d = \pm 1.6 \text{ m}$$



c) $d = 0.5$

$$h(0.5) = -1.17(0.5)^2 + 3$$

$$= \boxed{2.7 \text{ m}}$$

23. Let $x = \#$ of \$2 increases

$R = \text{revenue} = (\# \text{ of customers})(\text{price})$

$$R = (300 - 10x)(36 + 2x)$$

$$R = -20x^2 + 240x + 10800$$

$$R - 10800 = -20(x^2 - 12x)$$

$$R - 10800 - 720 = -20(x - 6)^2$$

$$R = -20(x - 6)^2 + 11520$$

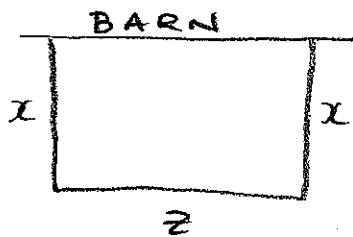
$\boxed{-6}$ $\textcircled{36}$

$x = 6$
 so $6 \times \$2 = \12
 increases...

price is $\boxed{\$48}$

$\boxed{\text{a } \$12 \text{ increase}}$

24.



$$2x + z = 60$$

$$A = xz$$

$$z = 60 - 2x$$

$$A = x(60 - 2x)$$

$$A = -2x^2 + 60x$$

$$A = -2(x^2 - 30x)$$

$$A - 450 = -2(x - 15)^2$$

$$A = -2(x - 15)^2 + 450$$

$$x = 15$$

$$z = 30$$

$$A = 450$$

$$\boxed{-15} \quad \boxed{225}$$

RADICALS:

$$a) \sqrt{x} - 2 = 0 ; \boxed{x \geq 0}$$

$$\sqrt{x} = 2$$

$$\boxed{x = 4}$$

$$b) \sqrt{x-3} + 6 = 2 ; \boxed{x \geq 3}$$

$$\sqrt{x-3} = -4$$

$$x - 3 = 16$$

$$x = \cancel{19}$$

extraneous

$\boxed{\text{NO SOLUTION}}$

$$c) \sqrt{4(x+3)} = 6, \quad x \geq -3$$

$$4(x+3) = 36$$

$$x+3 = 9$$

$$\boxed{x = 6}$$

$$d) \sqrt{2-x} = \sqrt{x-2}$$

$$2-x = x-2$$

$$4 = 2x$$

$$\boxed{x = 2}$$

$$\begin{aligned} x &\geq 2 \\ x &\leq 2 \\ \text{so... } \boxed{x = 2} \end{aligned}$$

$$e) \sqrt{\frac{x}{2} + 8} = \sqrt{4x+1}$$

$$\frac{x}{2} + 8 = 4x + 1$$

$$7 = \frac{7x}{2}$$

$$14 = 7x$$

$$\boxed{x = 2}$$

$$\begin{aligned} x &\geq -16 \\ x &\geq -\frac{1}{4} \end{aligned}$$

$$f) \sqrt{4(x+1)} = \sqrt{2x+3}$$

$$\begin{aligned} x &\geq -1 \\ x &\geq -\frac{3}{2} \end{aligned}$$

$$4x+4 = 2x+3$$

$$2x = -1$$

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

$$g) \sqrt{x+2} - \sqrt{x+5} = 3$$

$$x \geq -2 \quad x \geq -5$$

$$\sqrt{x+2} = 3 + \sqrt{x+5}$$

$$x+2 = 9 + 6\sqrt{x+5} + x+5$$

$$0 = 12 + 6\sqrt{x+5}$$

$$-12 = 6\sqrt{x+5}$$

$$-2 = \sqrt{x+5}$$

NO SOLUTION

$$h) \sqrt{x-4} + 1 = \sqrt{x+1}$$

$$x \geq 4 \quad x \geq -1$$

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

$$2\sqrt{x-4} = 4$$

$$\sqrt{x-4} = 2$$

$$x-4 = 4$$

$$x = 8$$

$$i) \sqrt{x-5} - \sqrt{2x+7} = -3$$

$$x \geq -5 \\ x \geq -\frac{7}{2}$$

$$\sqrt{x-5} + 3 = \sqrt{2x+7}$$

$$(x-5) + 6\sqrt{x-5} + 9 = 2x+7$$

$$6\sqrt{x-5} = x+3$$

$$36(x-5) = x^2 + 6x + 9$$

$$36x - 180 = x^2 + 6x + 9$$

$$0 = x^2 - 30x + 189$$

$$0 = (x-21)(x-9)$$

$$x = 21, 9$$