#1 $f(x) = x^2 - 6x + 5$

a) $x = -\frac{b}{2a} = -\frac{-6}{2} = 3$

$y = 9 - 18 + 5 = -4$

vertex point: $(3, -4)$

b) line of symmetry: $x = 3$

c) Min. point @ $(3, -4)$

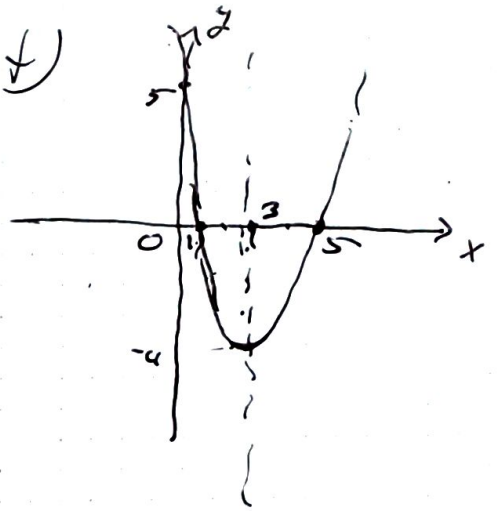
d) $x = 1, 5$

e) Range: $[-4, \infty)$

Domain: $\mathbb{R}$.

f) Inc: $(3, \infty)$ Dec: $(-\infty, 3)$

f)



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

a) $x = -\frac{b}{2a} = -\frac{4}{-2} = 2$

$y = -4 + 8 - 3 = 1$

Vertex point: $(2, 1)$

b) line of symmetry: $x = 2$

c) Max. point @ $(2, 1)$

d) $x = 1, 3$

$x = \frac{-4 \pm \sqrt{16 - 4(-1)(-3)}}{2(-1)}$

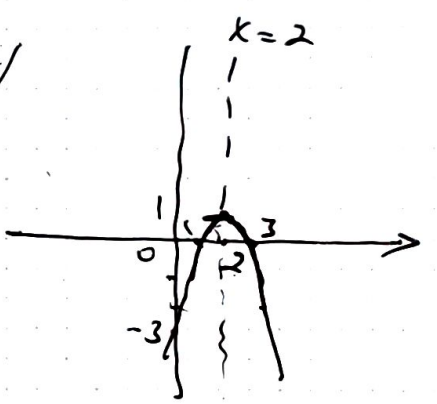
$x = 3, 1$ $= \frac{-4 \pm 2}{-2}$ $\begin{cases} \frac{-4-2}{-2} = 3 \\ \frac{-4+2}{-2} = 1 \end{cases}$

e) Range: $(-\infty, 1]$

Domain: $\mathbb{R}$

f) Inc. $(-\infty, 2)$ Dec: $(2, \infty)$

f)



Ex $x - \sqrt{15 - 2x} = 0$

Soln $(x)^2 = (\sqrt{15-2x})^2$

$x^2 = 15 - 2x$

$x^2 + 2x + 15 = 0$

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

$x = 3$ ✓ $\quad 3 - \sqrt{4-6}$

$x = -5$ ✗

$x = \sqrt{\quad}$

$\sqrt{\quad} = (+)$

$x^{m/n} = k \Rightarrow x = k^{n/m}$

$x = \pm$

$x = k^{n/m}$

Ex $5x^{3/2} = 25$

$x^{3/2} = 5$

$x = 5^{2/3}$

$= \sqrt[3]{5^2}$

$= \sqrt[3]{25}$

Ex $x^{2/3} = 4$

$x = 4^{3/2}$

$= \sqrt{4^3}$

$= 4\sqrt{4}$

$3 > 2$

1

$4^{7/2} = 4^3\sqrt{2}$

---

4 $7^{11/3} = 7^3 \sqrt[3]{7^2}$

$|x| = c \Rightarrow \begin{cases} x = -c \\ x = c \end{cases}$

Ex $|2x - 1| = 5$

$2x - 1 = -5$

$2x = -4$

$x = -2$

opposite sign

$2x - 1 = 5$

$2x = 6$

$x = 3$

Ex $4|1 - 2x| - 20 = 0$

$4|1 - 2x| = 20$

$|1 - 2x| = 5$

$1 - 2x = -5$

$-2x = -6$

$x = 3$

$1 - 2x = 5$

$-2x = 4$

$x = -2$

1.7 Inequalities. $> \geq < \leq$ (±)

Ex $3x+1 > 7x-15$
$-7x \quad -1 \qquad -7x \quad -1$

$\frac{-4x}{-4} \geq \frac{-16}{-4}$

$x < 4$

$(-\infty, 4)$ interval notation

$\{x \mid x < 4\}$ set

Ex 6) $\frac{x-4}{2} \geq \frac{x-2}{3} + \frac{5}{6}$ (x6

$3x - 12 \geq 2x - 4 + 5$

$3x - 2x \geq 12 + 1$

$x \geq 13$

Ex 5 $3(x-1) > 3x+2$

$3x - 3 > 3x + 2$

$3x - 3x > 2 + 3$

$0 > 5$ (False statement)

No. solution $\emptyset$, $\{\emptyset\}$ set

Ex $3(x+1) > 3x+2$

$3x + 3 > 3x + 2$

$3x - 3x > 2 - 3$

$0 > -1$ (T)

soln: $\mathbb{R}$ $(-\infty, \infty)$

Ex

$$-2 < 5 + 3x < 20$$
$$-5 \quad\quad -5 \quad\quad -5$$

$$-\frac{7}{3} < \frac{3}{3}x < \frac{15}{3}$$

$$\underline{-\frac{7}{3} < x \leq 5} \qquad \left(-\frac{7}{3}, 5\right]$$

Intersections $\cap$ common

Union $\cup$ collection

$|x| < c \Rightarrow \quad -c < x < c$

$|x| > c \Rightarrow \quad x < -c, \; x > c$

Ex $-3|5x-2|+20 \geq -19$

$$-3|5x-2| \geq -19-20$$
$$\leq -39$$

$$|5x-2| \leq \frac{-39}{-3} = 13$$

$$-13 \leq 5x-2 \leq 13$$
$$+2 \quad\quad +2 \quad\quad +2$$

$$-11 \leq 5x \leq 15$$

$$\underline{-\frac{11}{5} \leq x \leq 3} \qquad \left[-\frac{11}{5}, 3\right]$$

Ex $|2-5x| \geq -4$ all (+) > -1

soln: $\mathbb{R}$

Ex $|4x-7| < -3$ (+) $\not<$ (−)

no solution

$f(x) = ax^2+bx+c \quad > 0 \quad \geq 0$

$\leq 0 \quad < 0$

$a>0$ $\quad ax^2+bx+c \geq 0 \quad x \leq x_1 \text{ , } x \geq x_2$

$\leq 0 \quad x_1 \leq x \leq x_2$

$x_1 < x_2$

Ex solve $2x^2+5x-12 \geq 0$

$x = \frac{-5 \pm \sqrt{25+4(2)(12)}}{4}$

$= \frac{-5 \pm 11}{4}$ $\quad \frac{6}{4} = \frac{3}{2}$, -4

$x \leq -4 \quad x \geq \frac{3}{2}$

88 $x^2-5x+4 > 0$ $\quad x^2-5x+4=0$

$x = 1, 4$

$x < 1, \; x > 4$

Ex $x^3+3x^2 \leq x+3$

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

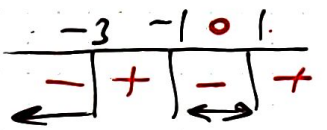
$x^2(x+3)-(x+3) = 0$

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

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

$x=-3 \quad x^2=1$

$x=\pm 1$



either

$(-\infty, -3] \cup [-1, 1]$

or

$x \leq -3 \quad -1 \leq x \leq 1$

Rational

x's $\to 0$

cond. condition

Ex $\dfrac{2x}{x+1} \geq 1$

$x \neq -1$ restriction

$x+1=0$, $x=-1$

$(x+1)\left(\dfrac{2x}{x+1} - 1 = 0\right)$

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

$2x-x-1=0$

$x=1$

-1	0	1
$+$	$-$	$+$

$x<-1$, $x \geq 1$

Ex $\dfrac{5}{x+4} \geq 1$ $\quad x \neq -4$

$(x+4)\left(\dfrac{5}{x+4} - 1 = 0\right)$

$5-(x+4)=0$

$5-x-4=0$

$1-x=0$

$x=1$

-4	0	1
$-$	$+$	$-$

$-4<x \leq 1$

Ex $\dfrac{2x-1}{3x+4} < 5$

$x \neq -\dfrac{4}{3}$

$3x=-4$, $x=-\dfrac{4}{3}$

$\dfrac{2x-1}{3x+4} - 5 = 0$

$2x-1-5(3x+4)=0$

$2x-1-15x-20=0$

$-13x-21=0$

$-13x=21$

$x=-\dfrac{21}{13}$

$-\frac{21}{13}$	$-\frac{4}{3}$	0
$-$	$+$	$-$

$x<-\dfrac{21}{13}$, $x>-\dfrac{4}{3}$

$\frac{4}{3} \times \frac{21}{13}$

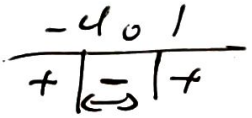
$52 \not< 63$

All rest of Hwk due Tomorrow 6/16

108 $\frac{x+4}{x-1} < 0$ $x \neq 1$

$\frac{0}{\neq 0} = 0$

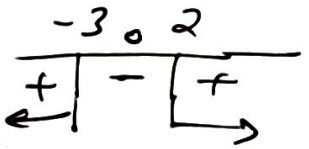
$x = -4$



$-4 < x \neq 1$

109 $\frac{x-2}{x+3} > 0$

$x \neq -3, \; x = 2$



$x < -3, \; x > 2$

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110 $\frac{x-5}{x+8} \geq 3$ $x \neq -8$

$(x+8)$ $\frac{x-5}{x+8} - 3 = 0$

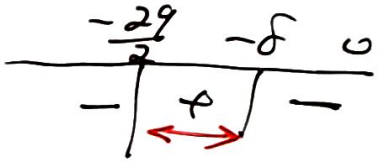
$x - 5 - 3(x+8) = 0$

$x - 5 - 3x - 24 = 0$

$-2x - 29 = 0$

$-2x = 29$

$x = -\frac{29}{2}$



$-\frac{29}{2} \leq x < -8$

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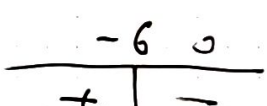
111 $\frac{x-4}{x+6} \leq 1$ $x \neq -6$

$x+6$ $\frac{x-4}{x+6} - 1 = 0$

$x - 4 - x - 6 = 0$

$0 - 10 = 0$



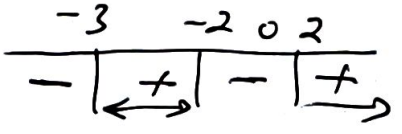
$x > -6$

105 $x^3 + 3x^2 - 4x - 12 \geq 0$

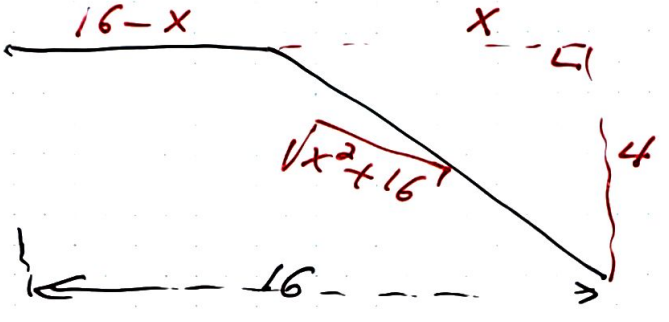
$x^2(x+3) - 4(x+3) = 0$

$(x+3)(x^2-4) = 0$

$x = -3$, $x^2 = 4 \rightarrow x = \pm 2$



$-3 \leq x \leq -2 \quad x \geq 2$



$v = r = \frac{d}{t}$

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

swims 7 km/h runs 22 km/h

$s = 7 \cdot t_1 = \sqrt{x^2+16}$ $r = 22 t_2 = 16 - x$

Total $t = 2$

x ?

$t_1 + t_2 = 2$

$\frac{\sqrt{x^2+16}}{7} + \frac{16-x}{22} = 2$

$22\sqrt{x^2+16} + 7(16-x) = 2(7)(22)$

$= 308$

$22\sqrt{x^2+16} = 308 - 7(16-x)$

$= 308 - 112 + 7x$

$= 7x + 196$

$(22\sqrt{x^2+16})^2 = (7x+196)^2$

$$484(16+x^2) = 49x^2 + 2,744x + 38,416$$

$$7744 + 4844x^2 - 49x^2 - 2744x - 38416 = 0$$

$$435x^2 - 2744x - 30672 = 0$$

$x = 12.1$

$-$ < 0 # distance

Ex $s(t) = 48t - 16t^2$

a) $s(t) = 0$

$16t(3 - t) = 0$ $\quad t = 0, 3$

b) t ? $s(t) > 20$ ft

$48t - 16t^2 > 20$ $\longrightarrow$ $-16t^2 + 48t - 20 > 0$ or $16t^2 - 48t + 20 < 0$

$-16t^2 + 48t - 20 = 0$

$-4t^2 + 12t - 5 = 0$

$$t = \frac{-12 \pm \sqrt{144 - 4(-4)(-5)}}{-8}$$

$$= \frac{-12 \pm \sqrt{144 - 80}}{-8} \quad \to 8$$

$$= \begin{cases} \frac{-12-8}{-8} = \frac{-20}{-8} = \frac{5}{2} \\ \frac{-12+8}{-8} = \frac{-4}{-8} = \frac{1}{2} \end{cases}$$

$$\frac{1}{2} < t < \frac{5}{2}$$