Chapter 0 Assignment

0.1 # 2, 4, 12, 18, 28
0.2 # 2, 8, 20, 32, 36
0.3 # 10, 24, 34, 38, 46
0.4 # 2, 16, 30, 50, 62
0.5 # 6, 20, 28, 44

Solutions

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2. -3678 is a whole number $\rightarrow$ rational.

4. $3\sqrt{2} - 1$ is irrational ($\sqrt{2}$ irrational)

12. $x + 1 < \frac{x}{3}$

a) $x = 0$ $\quad 0 + 1 < \frac{0}{3}$

$1 < 0$ does not satisfy

b) $x = 4$ $\quad 4 + 1 < \frac{4}{3}$

$5 < \frac{4}{3}$ does not satisfy

c) $x = -4$ $\quad -4 + 1 < -4/3$

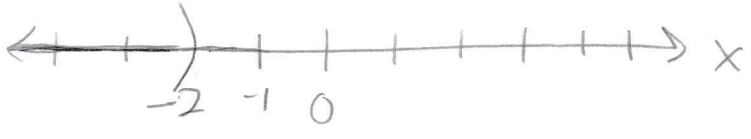
$-3 < -\frac{4}{3}$ does satisfy.

18) Solve and sketch.

$2x + 7 < 3$

$2x < -4$

$x < -2$



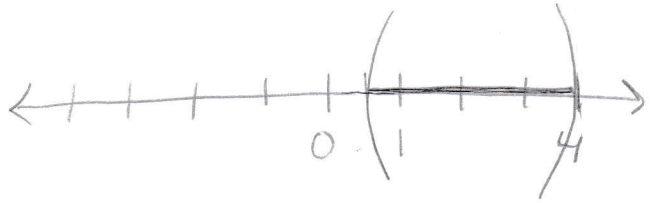
28) $2x^2 + 1 < 9x - 3$

$2x^2 - 9x + 4 < 0$

$(2x - 1)(x - 4) < 0$

Zeros at $2x - 1 = 0 \rightarrow x = \frac{1}{2}$

$x - 4 = 0 \rightarrow x = 4$



x	sign $(2x^2 - 9x + 4)$	< 0
0	$+4$	No
1	-3	yes
5	$+9$	No

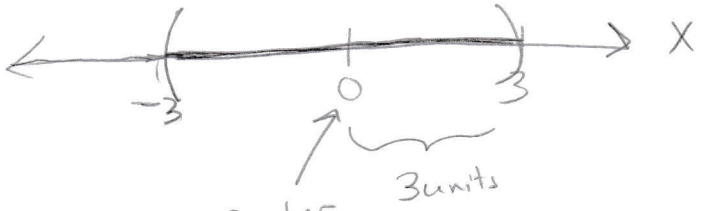
0.2 2) $a = -126,\ b = -75$

a) directed distance a to b $= b - a = -75 + 126 = 51$

b) " " b to a $= a - b = -126 + 75 = -51$

c) distance b/w a and b $= |a - b| = |-126 + 75| = 51$

8) $(-3, 3)$



$|x - 0| < 3$

$|x| < 3$

20) $|2x| < 6$

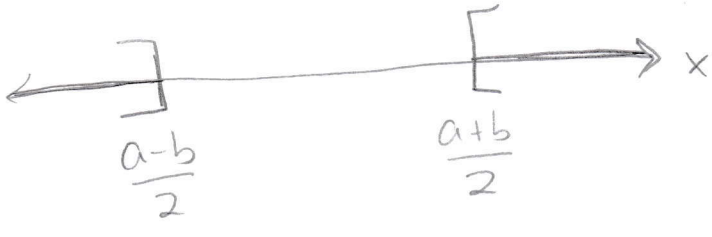
$|2| \cdot |x| < 6$

$|x| < 3$

same graph

$(-3, 3)$

32) $|2x - a| \geq b, \quad b > 0$



$2x \leq a - b$ OR $2x \geq a + b$

$x \leq \frac{a-b}{2}$ OR $x \geq \frac{a+b}{2}$

36) $[7.3, 12.7]$

Midpoint $= \frac{7.3 + 12.7}{2} = \frac{20}{2} = 10$

0.3 10) $\frac{1}{(-x)^{-3}}$ for $x = 4$

$$\frac{1}{(-4)^{-3}} = (-4)^3 = -64$$

24) Simplify $(4x^3)^2$

$$(4x^3)^2 = 16(x^3)^2$$
$$= 16x^6$$

34) $\sqrt[4]{(3x^2y^3)^4} = [(3x^2y^3)^4]^{1/4}$

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

38) $8x^4 - 6x^2$ Simplify by factoring.

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

46) Find the domain of $\sqrt{5-2x}$

Notice $5 - 2x \geq 0$ for this expression to be real.

$$5 \geq 2x$$
$$\frac{5}{2} \geq x$$
$$\left(-\infty, \frac{5}{2}\right]$$

0.4 2) $8x^2 - 2x - 1$ Use quadratic formula to find real zeros.

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{2 \pm \sqrt{4-4(8)(-1)}}{2(8)} = \frac{2 \pm \sqrt{36}}{16} = \frac{2 \pm 6}{16}$$

$$x = \frac{2-6}{16} = \frac{-4}{16} = -\frac{1}{4} \quad \text{and} \quad x = \frac{2+6}{16} = \frac{8}{16} = \frac{1}{2}$$

16) Factor $x^2 - xy - 2y^2$

$(x - 2y)(x + y)$

30) $x^3 - 5x^2 - 5x + 25$

Factor by grouping:

$= x^2(x-5) - 5(x-5)$

$= (x^2-5)(x-5)$

$= (x+\sqrt{5})(x-\sqrt{5})(x-5)$

50) $x^3 - 216$ Find all real zeros.

Special product: $x^3 - a^3 = (x-a)(x^2 + ax + a^2)$

$\sqrt[3]{216} = 6$

$x^3 - 216 = (x-6)(x^2 + 6x + 36)$

$x = \frac{-6 \pm \sqrt{36 - 4 \times 1 \times 36}}{2 \times 1} = \frac{-6 \pm \sqrt{-108}}{2}$

no real solutions!

$x - 6 = 0 \rightarrow x = 6$ is the only real zero

62) Use synthetic division $x^3 - 2x^2 - x + 2$ for zero at $x = 2$.

2	1	-2	-1	2
	↓	2	0	-2
	1	0	-1	0

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

0.5 6) $\dfrac{x}{x^2+x-2} - \dfrac{1}{x+2}$

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

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

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

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

20) $\dfrac{-\sqrt{x^2+1}}{x^2} + \dfrac{1}{\sqrt{x^2+1}}$

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

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

$= \dfrac{-1}{x^2\sqrt{x^2+1}}$

28) Rationalize the denominator.

$\dfrac{3}{\sqrt{21}} = \dfrac{3}{\sqrt{21}}\left(\dfrac{\sqrt{21}}{\sqrt{21}}\right)$

$= \dfrac{3\sqrt{21}}{21}$

$= \dfrac{\sqrt{21}}{7}$

44) $$\frac{\frac{\sqrt{x^2+1}}{x^2} - \frac{1}{x\sqrt{x^2+1}}}{x^2+1} = \left(\frac{\sqrt{x^2+1}}{x^2} - \frac{1}{x\sqrt{x^2+1}}\right)\left(\frac{1}{x^2+1}\right)$$

$$= \left[\frac{\sqrt{x^2+1}}{x^2}\left(\frac{\sqrt{x^2+1}}{\sqrt{x^2+1}}\right) - \frac{1}{x\sqrt{x^2+1}}\left(\frac{x}{x}\right)\right]\left(\frac{1}{x^2+1}\right)$$

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

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

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