Review: Set up a **linear equation** to describe the problem but do not solve.

How many liters of water should be evaporated from 160 liters of a 12% saline solution so that the solution that remains is a 20% saline solution?

	amount of solution	% concentration of salt	amount of dissolved substance
12% saline	160 L	0.12	0.12(160)
water	x	0	0
20% saline	160−x	0.2	0.2(160−x)

$$0.12(160) = 0.2(160-x)$$

3.6

35. $x^5+x^2 \geq 2x^3+2$

$$\underbrace{x^5-2x^3}+\underbrace{x^2-2} \geq 0$$

$$x^3(x^2-2)+1(x^2-2) \geq 0$$

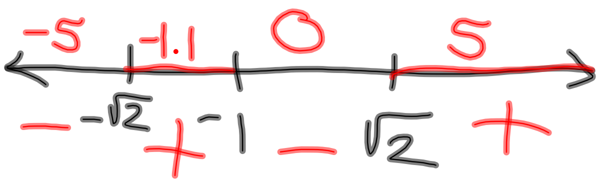
$$(x^2-2)(x^3+1) \geq 0$$

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

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

$x=\pm\sqrt{2}$ $\quad$ $x=-1$

$$\boxed{[-\sqrt{2},-1]\cup[\sqrt{2},\infty)}$$



61. $\dfrac{5x}{7x-2} > \dfrac{x}{x+1}$

$$\frac{5x(x+1) - x(7x-2)}{(7x-2)(x+1)} > 0$$

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

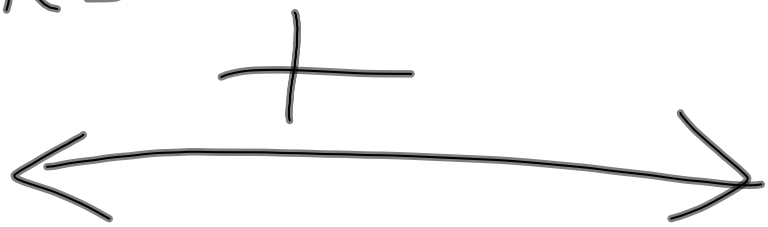
$$\frac{-2x^2+7x}{(7x-2)(x+1)} > 0$$

$$\frac{-x(2x-7)}{(7x-2)(x+1)} > 0$$

$$\frac{11x^2+5}{(x^2+1)(5x^2+2)} \geq 0$$

no real zeros,
no V.A.'s

$$\boxed{(-\infty, \infty)}$$



59. $\dfrac{5(2x+1)-3(x^2+3x)}{(x^2+3x)(2x+1)} < 0$

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

$10x+5-3x^2-9x$

$-3x^2+x+5$

quadratic formula

3.6

64. Solve the inequality.

$$\frac{2x}{x^2-9}+\frac{x}{x^2+x-12} \geq \frac{3x}{x^2+7x+12}$$

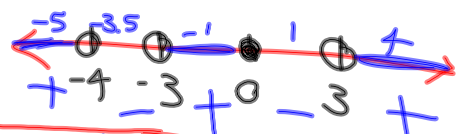
$$\frac{2x}{(x+3)(x-3)} + \frac{x}{(x+4)(x-3)} - \frac{3x}{(x+3)(x+4)} \geq 0$$

$$\frac{2x(x+4)+x(x+3)-3x(x-3)}{(x+3)(x-3)(x+4)} \geq 0$$

$$\frac{\cancel{2x^2}+8x+\cancel{x^2}+3x-\cancel{3x^2}+9x}{(x+3)(x-3)(x+4)} \geq 0$$

$$\frac{20x}{(x+3)(x-3)(x+4)} \geq 0$$

$-3 \quad 3 \quad -4$



$\boxed{(-\infty,-4)\cup[-3,0]\cup(3,\infty)}$

3.6

36. $x^5+24>3x^3+8x^2$
(can factor by grouping)

38. $2x^3+x^2<10+11x$

$2x^3+x^2-11x-10<0$

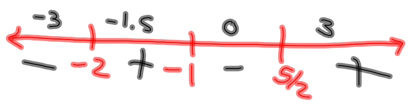
possible rational zeros:
$\frac{\text{factors of } 10}{\text{factors of } 2} = \frac{\pm 10, 5, 2, 1}{\pm 2, 1}$

-1	2	1	-11	-10
		-2	1	10
	2	-1	-10	$\boxed{0}$

$(x+1)(2x^2-x-10)<0$

$(x+1)(2x-5)(x+2)<0$

$-1 \quad 5/2 \quad -2$



$\boxed{(-\infty,-2)\cup(-1,\tfrac{5}{2})}$

33. $x^3-2x^2<5x-6$

$x^3-2x^2-5x+6<0$

possible rational zeros: $\pm 6, \pm 3, \pm 2, \pm 1$

+1 works

1	1	-2	-5	6

3.7 Variation and Applications

2-variable direct variation

"y varies directly with x"

$$y = kx$$

k = constant of variation

8. y varies directly as x.
$y = 3$ when $x = 33$.

Find the variation constant and write an equation of variation.

$y = kx$

$3 = k(33)$

$\frac{1}{11} = \frac{3}{33} = k$

$\boxed{k = \frac{1}{11}}$

$\boxed{y = \frac{1}{11}x}$

Inverse/Indirect Variation

$$y = k \cdot \frac{1}{x}$$

4. y varies inversely with x.
   $y=12$ when $x=5$.

$y = k \cdot \frac{1}{x}$

$12 = k \cdot \frac{1}{5}$

$60 = k$

$y = 60 \cdot \frac{1}{x}$

$\boxed{y = \frac{60}{x}}$

34. y varies jointly as x and z
(directly w/ more than one variable)
and inversely as the square of ω.
$y = \frac{12}{5}$ when $x=16$, $z=3$, & $\omega=5$

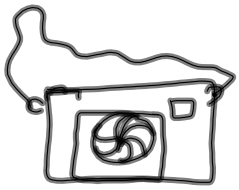
$y = k \cdot \frac{xz}{\omega^2}$

$\frac{12}{5} = k \cdot \frac{16(3)}{5^2}$

$k = \frac{\cancel{12}}{\cancel{5}} \cdot \frac{5^{\cancel{2}}}{\cancel{16}(\cancel{3})}$
4

$k = \frac{5}{4}$

$\boxed{y = \frac{5xz}{4w^2}}$



aperture - size of opening

f-stop - time

22. The f-stop of a 23.5 mm-diameter lens is directly proportional to the focal length F of the lens. If a 150-mm focal length has an f-stop of 6.3, find the f-stop of a 23.5-mm diameter lens with a focal length of 80 mm.

$f = kF$

$6.3 = k150$

$\frac{6.3}{150} = k$

$f = \frac{6.3}{150}F$

$f = \frac{6.3}{150}(80) \approx \boxed{3.36}$

38. weight W varies inversely as the square of the distance d from the center of the earth.
At sea level (3978 mi from center), an astronaut weighs 220 lb.
Find his weight if he is 200 mi above the surface of earth.

$W = k \cdot \frac{1}{d^2}$

$220 = \frac{k}{(3978)^2}$

$k = 220(3978)^2$

$W = \frac{220(3978)^2}{d^2}$

$W = \frac{220(3978)^2}{(3978+200)^2}$

$\boxed{\approx 199 \text{ lb}}$

HW

3.7 # 25-33 odd

23, 37