# 2.7 Solving Equations in One Variable

## Ex 1 Clear Fractions

$$x\left(x+\frac{3}{x}=4\right)$$

$x^2+3=4x$

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

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

Solve $x=1, 3$

Check

$1+\frac{3}{1}=4$

$1+3=4$ ✓

$3+\frac{3}{3}=4$

$3+1=4$ ✓

## Ex 2 Rational

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

$x^2-4x+1=0$

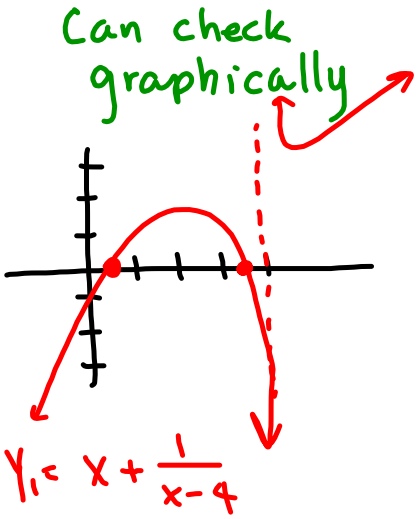
QF

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

$$\frac{4\pm\sqrt{12}}{2}\approx 2\pm\sqrt{3}\approx x\approx 3.732, \approx 0.267$$

$-\frac{1}{4}$

Can check graphically



Ex 3 Extraneous

$$\frac{2x}{x-1}+\frac{1}{x-3}=\frac{2}{x^2-4x+3}$$

$(x-1)(x-3)$

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

$$2x^2-5x-1=2$$

$$2x^2-5x-3=0$$

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

$$x=-\tfrac{1}{2},3$$

CHECK FOR Extraneous in ORIGINAL EQ.

FYI, could elim. $x=3$ b/c of it causing a zero in the denominator

$\therefore x=3$ is extraneous

$x=-\frac{1}{2}$ is a solution

Ex 4 Extraneous

$$\frac{x-3}{x}+\frac{3}{x+2}+\frac{6}{x^2+2x}=0$$

$x(x+2)$

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

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

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

$$x=0,-2$$

CHECK

both x-values are extraneous b/c each will cause a zero in the denominator.

$\therefore$ this eq. has no solutions

Ex 5 Mixture (different method)

How much pure acid must be added to 50 mL of a 35% solution to produce a mixture that is 75% acid?

how much pure acid in here?
$50 \times 0.35 = 17.5$

parts: $\frac{1x + 17.5}{x + 50} = 0.75$ (end %)

whole: new / new, old / old

$Y_1$ $Y_2$

• in graphing calc
then look for intersection
(80, 0.75) add 80mL of pure acid

Ex 7 Designing a Juice Can (application)

Stewart Cannery will package tomato juice in a 2-L cylindrical cans. Find the radius and height of the can if they have a surface area of 1000 cubic cm.

FACT
$1L = 1000 cm^3$

$V = \pi r^2 h$

$\frac{2000}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$

$\frac{2000}{\pi r^2} = h$

$S = 2\pi r^2 + 2\pi r h$

$1000 = 2\pi r^2 + 2\pi r h$

$1000 = 2\pi r^2 + 2\pi r \left(\frac{2000}{\pi r^2}\right)$

$1000 = 2\pi r^2 + \frac{4000}{r}$

$Y_1$ $Y_2$

Graphically
(x, y)
(r, S) again look for intersections

2 possible radius

$r = 4.62$ cm
$h = 29.83$ cm

or

$r = 9.65$ cm
$h = 6.83$ cm

use $\frac{2000}{\pi r^2} = h$

p253 # 6, 8, 12, 13,
15, 17, 19, 24, 28,
30, 31, 35, 36, 37