9.4B notes: the zero product property

recall the 2 forms of polynomials:

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

How can we solve for x in factored form?

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

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

$+3\ +3$ $\quad$ $-2\ -2$

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

$x=3,-2$

b) $(x+1)(x+3)=0$

$x+1=0$ $\quad$ $x+3=0$

$-1\ -1$ $\quad$ $-3\ -3$

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

$x=-1,-3$

- These x-values are called roots, x-intercepts

- This property is called the zero product property.
  To use ZPP, the polynomial must be in factored form & the equation must $=0$

- The ZPP: If $a \cdot b = 0$, then $a=0, b=0$
  $a=0, b=0$

Practice!

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

$2x+3=0$ $\quad$ $x-4=0$

$-3\ -3$ $\quad$ $+4\ +4$

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

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

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

2) $6x(x-4)=0$

$\frac{6x}{6}=\frac{0}{6}$ $\quad$ $x-4=0$

$+4\ +4$

$x=0$ $\quad$ $x=4$

$x=0,4$

3) $x(y-8)(2y-9)=0$

$x=0$ $\quad$ $y-8=0$ $\quad$ $2y-9=0$

$+8\ +8$ $\quad$ $+9\ +9$

$y=8$ $\quad$ $\frac{2y}{2}=\frac{9}{2}$

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

$x=0, y=8, \frac{9}{2}$

Put it all together! Factor out the GCF & solve using the ZPP!

1) $2x^2 + 8x = 0$

$\frac{2x}{2x}$

$2x(x + 4) = 0$

$2x = 0 \quad x + 4 = 0$

$\frac{2x}{2} = \frac{0}{2} \quad -4 \quad -4$

$x = 0 \quad x = -4$

$x = 0, -4$

2) $6n^2 - 15n = 0$

$3n(2n - 5) = 0$

$\frac{3n}{3} = \frac{0}{3} \quad 2n - 5 = 0$

$n = 0 \quad n = 5/2$

$n = 0, 5/2$

3) $-3s^2 = 39s$

$+3s^2 \quad +3s^2$

$0 = 3s^2 + 39s$

$0 = 3s(s + 13)$

$\frac{0}{3} = \frac{3s}{3} \quad 0 = s + 13$

$0 = s \quad -13 \quad -13$

$-13 = s$

$s = 0, -13$

4) $4x^2 = 16x$

$-16x \quad -16x$

$4x^2 - 16x = 0$

$4x(x - 4) = 0$

$\frac{4x}{4} = \frac{0}{4} \quad x - 4 = 0$

$x = 0 \quad x = 4$

$x = 0, 4$

5) $\frac{18c^2}{6c} + \frac{6c}{6c} = 0$

$6c(3c + 1) = 0$

$6c = 0 \quad 3c + 1 = 0$

$c = 0 \quad c = -\frac{1}{3}$

6) $28m^2 = -8m$

$+8m \quad +8m$

$28m^2 + 8m = 0$

$4m(7m + 2) = 0$

$4m = 0 \quad 7m + 2 = 0$

$m = 0 \quad m = -\frac{2}{7}$