Two numbers, A & B. And all I know is that $AB = 0$.

Any possibilities?

$A = 2, B = 0 \Rightarrow AB = 2 \cdot 0 = 0$

$A = 32\pi, B = 0 \Rightarrow 32\pi \cdot 0 = 0$

$\approx 32 \cdot 3.14$

Basically, anything for one and

$A = 2, B = \frac{1}{2} \quad AB = 1 \neq 0$

Principle of zero products:

$AB = 0 \Rightarrow$

$A = 0$ OR $B = 0$

This is WHY we factor.

$x^2 - 9 = 0$

$x^2 - 3^2 = 0$

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

$A \cdot B = 0 \Rightarrow$

$A = 0$ OR $B = 0$

$x - 3 = 0$ OR $x + 3 = 0$

$x = 3$ OR $x = -3$

Quadratic Equation
2nd-degree polynomial equation
Has an x^2 in it

Two Linear equations
Has x^1 as highest power!

Factoring turns a HARD quadratic equation into a pair of EASY linear equations.

Down the road, we'll only factor things we're <u>good</u> at factoring (the easy ones) and we'll clobber 'em with the quadratic formula when we're NOT good at factoring.

We won't waste much time on factoring the toughies, like yesterday's example.

This was hard.

$10x^2 - 9x - 91 = [2x-7][5x+13]$ is now factored!

$-9x = -10x + 1x$ $\quad (10)(1) = -10 \neq -910 =$

$-9x = -35x + 26x$ $\quad (-35)(26) = -910!$ magic number!

$10x^2 - 9x - 91$

$= 10x^2 - 35x + 26x - 91$ & factor by grouping.

$= 5x[2x-7] + 13[2x-7]$

$= [2x-7][5x+13]$

If you KNOW

$10x^2-9x-91 = [2x-7][5x+13]$, then you can solve $10x^2-9x-91=0$

$(2x-7)(5x+13)=0$

$2x-7=0$ OR $5x+13=0$

$+7=+7$

$2x=7$ $\qquad 5x=-13$

$\frac{2x}{2}=\frac{7}{2}$

$x=\frac{7}{2}$ OR $x=-\frac{13}{5}$

Check: $10x^2-9x-91=0$

$10\left(\frac{7}{2}\right)^2-9\left(\frac{7}{2}\right)-91=0$?

$10\left(\frac{7^2}{2^2}\right)-\left(\frac{9}{1}\right)\left(\frac{7}{2}\right)-91=0$?

$\left(\frac{10}{1}\right)\left(\frac{49}{4}\right)-\frac{63}{2}-91=0$?

$\frac{490}{4}-\frac{63}{2}-91=0$?

$\frac{245}{2}-\frac{63}{2}-91=0$?

$\frac{182}{2}-91=0$?

$91-91=0$! Sweet!

So what sorts of factoring do I want?

S'5.7 a^2-b^2, $a^2-2ab+b^2$, $a^2+2ab+b^2$

a^3-b^3, a^3+b^3 } Bonus.

S'5.6 "Easy ones" #s 1-8, 35-42

u-substitution

$x^2+bx+c=0$

$x^2+9x+20=0$

Magic #: 20

Sum is 9, product is 20

8+1	8
7+2	14
6+3	18
5+4	20 sweet!

$x^2+5x+4x+20=0$

$x(x+5)+4(x+5)=0$

$(x+5)(x+4)=0$

$x=-5$ OR $x=-4$

#s1-8 S' 5.6 are like this.

Another method.

$x^2+9x+20=0$

$(x+1)(x+20)=x^2+21x+20$ No

$(x+2)(x+10)=x^2+12x+20$ No

$(x+4)(x+5)=x^2+9x+20$ Sweet!

#s 35-42 are u-substitution problems.

Recognizing when an equation is "quadratic in form"

Goal down the road is solving $x^4 - x^2 - 20 = 0$

(36) $x^4 - x^2 - 20$

Let $u = x^2$

$x^4 = x^{2 \cdot 2} = (x^2)^2$

$x^4 - x^2 - 20$

$= (x^2)^2 - x^2 - 20$

$= u^2 - u - 20$

Magic: -20

sum	product
$-2+1$	-2
$-3+2$	-6
$-4+3$	-12
$-5+4$	-20 ! Sweat!

$= u^2 - 5u + 4u - 20$

$= u(u-5) + 4(u-5)$

$= (u-5)(u+4)$

Twisted! $= (x^2-5)(x^2+4)$ is Done, for now.

$= (x^2 - (\sqrt{5})^2)(x^2+4)$

$= (x+\sqrt{5})(x-\sqrt{5})(x^2+4)$

$(\sqrt{5})^2 = (\sqrt{5})(\sqrt{5}) = 5$

$a^2 - b^2 = (a+b)(a-b)$

38 $(3x-1)^2 + 5(3x-1) + 6 = 0$

Let $u = 3x-1$. Then

$u^2 + 5u + 6$ is what we have.

$= u^2 + 2u + 3u + 6 = 0$

$= u(u+2) + 3(u+2) = 0$

$= (u+2)(u+3) = 0$ u has served its purpose.

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

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

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

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

Test Wednesday

So, #s 1-8, 35-42 in §5.6 is the extent of §5.6

Skip 5.7, 5.8

#s 1-8: Treat like EQUATIONS and SOLVE those equations. Put an "= 0" after every one.

#s 37, 38 treat like equations, also.