9.7: Factor Special Products

Goals: *Recognize when polynomials are factorable by special products formulas

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RECALL

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

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

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

What do all three have in common? They all start and end with perfect squares

**The important one to recognize is: $a^2 - b^2$ (the other two can be factored using the methods we have already learned, this one cannot)

Factor:

Ex: $y^2 - 16$

$(y + 4)(y - 4)$

Ex: $x^2 - 9$

$(x - 3)(x + 3)$

Ex: $25m^2 - 16$

$(5m - 4)(5m + 4)$

Ex: $x^2 - 49y^2$

$(x - 7y)(x + 7y)$

Ex: $8 - 18n^2$

$2(4 - 9n^2)$
$2(2 + 3n)(2 - 3n)$

Ex: $4y^2 - 64$

$4(y^2 - 16)$
$4(y + 4)(y - 4)$

Ex: $64c^2 - 16$

$16(c^2 - 1)$
$16(c - 1)(c + 1)$

Ex: $x^2 - 81y^2$

$(x + 9y)(x - 9y)$

Ex: $12 - 48m^2$

$12(1 - 4m^2)$
$12(1 + 2m)(1 - 2m)$

Ex: $n^2 - 12n + 36$

$(n - 6)^2$

Ex: $9x^2 - 12x + 4$

$(3x - 2)^2$

Ex: $4s^2 + 4st + t^2$

$(4s + t)^2$

Ex: $a^2 + 6a + 9$

$(a + 3)^2$

Ex: $4n^2 + 20n + 25$

$(2n + 5)^2$

Ex: $9c^2 - 6cd + d^2$

$(3c - d)^2$

Ex: $-3y^2 + 36y - 108$

$-3(y^2 - 12y + 36)$
$-3(y - 6)^2$

Ex: $-2x^2 - 16x - 32$

$-2(x^2 + 8x + 16)$
$-2(x + 4)^2$

Ex: $h^2 + 4h + 4$

$(h + 2)^2$

Ex: $2y^2 - 20y + 50$

$2(y^2 - 10y + 25)$
$2(y - 5)^2$

Ex: $3x^2 + 6xy + 3y^2$

$3(x^2 + 2xy + y^2)$
$3(x + y)^2$

Solve:

Ex: $x^2 + \frac{2}{3}x + \frac{1}{9} = 0$

$\left(x + \frac{1}{3}\right)^2 = 0$

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

Ex: $x^2 - 5x + \frac{25}{4} = 0$

$\left(x - \frac{5}{2}\right)^2 = 0$

$x = \frac{5}{2}$

Ex: $a^2 + 6a + 9 = 0$

$(a + 3)^2 = 0$

$a = -3$

Ex: $w^2 - 14w = -49$

$w^2 - 14w + 49 = 0$
$(w - 7)^2 = 0$
$w = 7$

Ex: $n^2 - 81 = 0$

$(n - 9)(n + 9) = 0$
$n = 9, n = -9$

Ex: $x^2 = 49$

$x^2 - 49 = 0$
$(x + 7)(x - 7) = 0$
$x = 7, x = -7$

Ex: A window washer drops a wet sponge from a height of 64 feet. After how many seconds does the sponge land on the ground?

*When you drop something its initial velocity is zero!

$h = -16t^2 + 64$
$0 = -16(t^2 - 4)$
$0 = -16(t + 2)(t - 2)$
$t = 2$

Ex: A rock is dropped from a riverbank that is 4 feet above the surface of the river. After how many seconds does the rock hit the water?

$h = -16t^2 + 4$
$0 = -4(4t^2 - 1)$
$0 = -4(2t + 1)(2t - 1)$
$t = ½$ seconds