Warm-Up

Solve $3x^2 + 2x - 1 = 0$ by decomposition by completing the square

"new way"

Factor

Decomposition

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

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

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

$3x-1=0$ $x+1=0$

$3x=1$ $x=-1$

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

Completing the square

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

$3\left(x^2 + \frac{2}{3}x + \frac{1}{9} - \frac{1}{9} - 1\right) = 0$

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

$3\left(x+\frac{1}{3}\right)^2 - \frac{4}{3} = 0$

$3\left(x+\frac{1}{3}\right)^2 = \frac{4}{3}$

Square root property

$\sqrt{\left(x+\frac{1}{3}\right)^2} = \sqrt{\frac{4}{9}}$

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

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

$x_1 = -\frac{1}{3} + \frac{2}{3} = \frac{1}{3}$

$x_2 = -\frac{1}{3} - \frac{2}{3} = -\frac{3}{3} = -1$

p241 #5a) $\sqrt{(x-3)^2} = \sqrt{4}$

$(x-3) = \pm 2$

$x = 3 \pm 2$

$x_1 = 3+2 = 5$

$x_2 = 3-2 = 1$

f) $\sqrt{(x+4)^2} = \sqrt{18}$

$x+4 = \pm\sqrt{18}$

$x = -4 \pm \sqrt{18}$

$x = -4 \pm 3\sqrt{2}$

p241 #5 b,c,d

#6. a,b,c

$\sqrt{18}$

$\sqrt{9}\sqrt{2}$

$3\sqrt{2}$

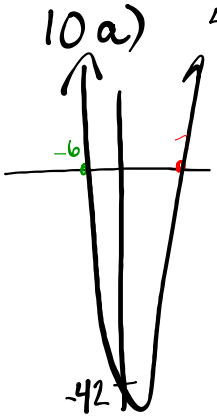
10a) $42 = x^2 - x$

$0 = x^2 - x - 42$

$0 = (x-7)(x+6)$

$x-7=0$ $x+6=0$

$x=7$ $x=-6$

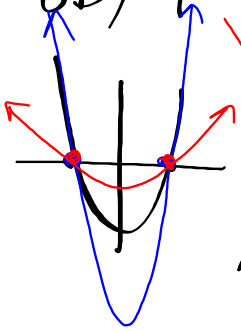


7d) $2x(x+5) = 0$

$2x=0$ $x+5=0$

$x=0$ $x=-5$

8b) $\frac{1}{4}x^2 + \frac{5}{4}x + 1 = 0$



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

$(x+1)(x+4) = 0$

$x=-1$ $x=-4$

easy

$x^2-2x-8=0$

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

$x=4$ $x=-2$

not factorable → $x^2-2x-9=0$

$x^2-2x-15=0$

$(x-5)(x+3)=0$

$x=5$ $x=-3$

$x^2-2x-8=0$

$x^2-2x+\frac{1-1}{}-8=0$

$(x-1)^2-9=0$

new → $(x-1)^2=9$

$(x-1)=\pm 3$

$x=1\pm 3$

1st x-int is $x=1+3$, $x=4$

2nd x-int is $x=1-3$, $x=-2$

$x^2-2x-9=0$

$x^2-2x+1-1-9=0$

$(x-1)^2-10=0$

new → $\sqrt{(x-1)^2}=\sqrt{10}$

$(x-1)=\pm\sqrt{10}$

$x=1\pm\sqrt{10}$

1st Root → $1+\sqrt{10}\doteq 4.2$

2nd Root → $1-\sqrt{10}=-2.2$

$x=\sqrt{36}$

$x=6$ ✓

$\sqrt{x^2}=\sqrt{36}$

$x=\pm 6$

$x=6$ OR $x=-6$

$x^2-10x-24=0$

Factor

$(x-12)(x+2)=0$

$x=12$ $x=-2$

Complete the square

$x^2-10x+25-25-24=0$

$(x-5)^2-49=0$

$\sqrt{(x-5)^2}=\sqrt{49}$

$(x-5)=\pm 7$

$x=5\pm 7$

$x_1=5+7=12$

$x_2=5-7=-2$

5c) $\sqrt{\left(d+\frac{1}{2}\right)^2}=\sqrt{1}$

$d+\frac{1}{2}=\pm 1$

$d=-\frac{1}{2}\pm 1$

$d_1=-\frac{1}{2}-1=-\frac{1}{2}-\frac{2}{2}=-\frac{3}{2}$

$d_2=-\frac{1}{2}+1=-\frac{1}{2}+\frac{2}{2}=\frac{1}{2}$

5f) $\sqrt{(x+4)^2} = \sqrt{18}$

$x+4 = \pm\sqrt{18}$

$x = -4 \pm \sqrt{18}$

$x = -4 \pm 3\sqrt{2}$

$\sqrt{18}$

$\sqrt{9}\sqrt{2}$

$3\sqrt{2}$

Simplify Radicals

ex $\sqrt{12}$ $\sqrt{45}$ $\sqrt{72}$

$\sqrt{4}\sqrt{3}$ $\sqrt{9}\sqrt{5}$ $\sqrt{9}\sqrt{8}$ $\sqrt{36}\sqrt{2}$

$2\sqrt{3}$ $3\sqrt{5}$ $3\sqrt{8}$ $6\sqrt{2}$

$3(\sqrt{4}\sqrt{2})$

$3(2\sqrt{2})$

$6\sqrt{2}$

Factoring by completing the Square (Finding x-intercepts)

EXAMPLE:

Determine the x-intercepts of the following...

$y = x^2 + 4x + 1$

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

$y = (x+2)^2 - 3$

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

$\sqrt{3} = \sqrt{(x+2)^2}$

$\pm\sqrt{3} = x + 2$

$-2 \pm \sqrt{3} = x$

$-2 - \sqrt{3} = x_1$

$-3.7 = x_1$

$-2 + \sqrt{3} = x_2$

$-0.3 = x_2$

Note

GRAPH??

EXAMPLE

$y = x^2 + 6x - 7$

Find x-intercepts by:
1. Factoring by inspection
2. Factoring by completing the square

Solution

EXAMPLE #3 - What is happening if the left side is negative?

$y = -2(x - 5)^2 - 4$

$0 = -2(x-5)^2 - 4$

$4 = -2(x-5)^2$

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

error! no x-int!

???

no Real Roots

Solve the following quadratic equations by **completing the square:**

$x^2 + 3x = x + 11$

$10x^2 - 3 = x$

Create a quadratic function with the follow $-3 \pm \sqrt{2}$

(Hint: Try and Reverse the completing the square process)