

class notes for Algebra 8r 14MAR13

$$20. 1 + x - x^2 = 0$$

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

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

$$\begin{array}{r} +1 \quad +1 \\ \hline x^2 - x \end{array} = 1$$

$$\begin{array}{r} \left(-\frac{1}{2}\right)^2 \quad \left(-\frac{1}{2}\right)^2 \\ \hline x^2 - x + \frac{1}{4} \end{array}$$

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

$$\left(x - \frac{1}{2}\right)^2 = \frac{5}{4}$$

$$\sqrt{\left(x - \frac{1}{2}\right)^2} = \sqrt{\frac{5}{4}}$$

$$x - \frac{1}{2} = \pm \sqrt{\frac{5}{4}}$$

$$\begin{array}{r} +\frac{1}{2} \quad +\frac{1}{2} \\ \hline x = \frac{1}{2} \pm \sqrt{\frac{5}{4}} \end{array}$$

$$\begin{array}{l} \swarrow \quad \searrow \\ \frac{1}{2} + \sqrt{\frac{5}{4}} \quad \frac{1}{2} - \sqrt{\frac{5}{4}} \\ \approx 1.62 \quad \approx -0.62 \end{array}$$

20. $1 + x - x^2 = 0$

Solve by Completing the square

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

$x^2 - x - 1 = 0$
 $\quad +1 \quad +1$

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

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

$\sqrt{\left(x - \frac{1}{2}\right)^2} = \sqrt{\frac{5}{4}}$

$x - \frac{1}{2} = \pm \sqrt{\frac{5}{4}}$

$x - \frac{1}{2} = \pm \sqrt{\frac{5}{4}}$

$\quad +\frac{1}{2} \quad +\frac{1}{2}$

$x = \frac{1}{2} \pm \sqrt{\frac{5}{4}}$

$x \approx 1.62 \quad x \approx -0.62$

Solve by Square Root method

$$-\frac{2}{3}x^2 + 4 = -9$$

$$\frac{-\frac{2}{3}x^2 + 13 = 0}{+9 \quad +9}$$

$$\Rightarrow \left(-\frac{2}{3}x^2\right)^{-\frac{3}{2}} = -13^{-\frac{3}{2}}$$

$$\sqrt{x^2}$$

$$= -13\left(-\frac{3}{2}\right)$$

$$x = \pm \sqrt{\frac{39}{2}} \approx \pm 4.42$$

If you drop your new iPhone 5 from the top of the Eiffel Tower, 1454 feet, then how long will it take to smash on the ground?
 $(h = -16t^2 + s)$

$$\begin{aligned}
 & -16t^2 + 1454 = 0 \\
 \Rightarrow & \quad \frac{1454}{16} = \frac{16t^2}{16} \\
 & \quad \frac{1454}{16} = t^2
 \end{aligned}$$

$$\sqrt{t^2} = \sqrt{\frac{1454}{16}}$$

$$\begin{aligned}
 t &= \pm \sqrt{\frac{1454}{16}} \\
 &\approx \pm 9.53
 \end{aligned}$$

$$\approx 9.53 \text{ seconds}$$

How are these two equations
related? $y = 3x^2 + 4x - 5$
and $0 = 3x^2 + 4x - 5$

Solve by factoring

$$3x^2 + 8x + 9 = 4$$

$$\Rightarrow 3x^2 + 8x + 5 = 0$$

$$(3x + 5)(x + 1) = 0$$

↓

$$3x + 5 = 0$$
$$\Rightarrow 3x = -5$$

$$\Rightarrow x = -\frac{5}{3}$$

or

↓

$$x + 1 = 0$$

$$\Rightarrow x = -1$$

40. $4x^2 - 13x + 3 = 0$

$$\begin{array}{r} -3 \quad -3 \\ \hline 4x^2 - 13x = -3 \\ \hline 4 \quad 4 \quad 4 \\ \hline x^2 - \frac{13}{4}x = -\frac{3}{4} \end{array}$$

$$\begin{array}{r} \left(-\frac{13}{8}\right)^2 \quad \left(-\frac{13}{8}\right)^2 \\ \hline \left(x - \frac{13}{8}\right)^2 = -\frac{3}{4} + \left(-\frac{13}{8}\right)^2 \\ \left(x - \frac{13}{8}\right)^2 = \frac{121}{64} \end{array}$$

$$\sqrt{\left(x - \frac{13}{8}\right)^2} = \sqrt{\frac{121}{64}}$$

$$\begin{array}{r} x - \frac{13}{8} = \pm \frac{11}{8} \\ +\frac{13}{8} \quad +\frac{13}{8} \\ \hline x = \frac{13}{8} \pm \frac{11}{8} \end{array}$$

$$\begin{array}{l} \swarrow \quad \searrow \\ \frac{24}{8} \quad (-3) \quad \frac{2}{8} \quad \left(\frac{1}{4}\right) \end{array}$$

32. $4x^2 - 25 = 0$

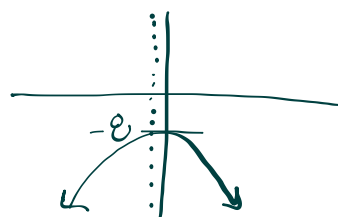
$$\begin{array}{r} +25 +25 \\ \hline 4x^2 = 25 \\ \hline 4 \quad 4 \\ \hline \sqrt{4x^2} = \sqrt{\frac{25}{4}} \end{array}$$

$$\sqrt{20} = \sqrt{4} \sqrt{5} \\ = 2\sqrt{5}$$

$$x = \pm \sqrt{\frac{25}{4}} = \pm \frac{\sqrt{25}}{\sqrt{4}} = \pm \frac{5}{2}$$

$$y = -2x^2 - 3x - 8$$

Does it open
up or down? Explain.



Open down, , because $a < 0$

vertex? $x = \frac{-b}{2a} = \frac{3}{2(-2)} = -\frac{3}{4}$

$$y = -2\left(-\frac{3}{4}\right)^2 - 3\left(-\frac{3}{4}\right) - 8 = -6.875$$

$$\left(-0.75, -6.875\right)$$

on.wikipedia.org/wiki/Empire_State_Building

The **Empire State Building** is a 102-story skyscraper located in Midtown ... meters), and with its antenna spire included, it stands a total of 1,454 ft (443.2 m) high.

How long would it take for your
new iPhone 5 to smash on the ground?
($h = -16t^2 + s$)

$$0 = -16t^2 + 1454$$

$$\Rightarrow -1454 = -16t^2$$

$$\Rightarrow \frac{-1454}{-16} = t^2$$

$$\Rightarrow t \approx 9.53 \text{ seconds}$$

Let's derive the quadratic formula "formula" way

$$\begin{aligned}
 &ax^2 + bx + c = 0 \\
 &x^2 + \frac{b}{a}x + \frac{c}{a} = 0 \\
 &x^2 + \frac{b}{a}x = -\frac{c}{a} \\
 &x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2 \\
 &\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \frac{b^2}{4a^2} \\
 &\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2} \\
 &\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2} \\
 &\sqrt{\left(x + \frac{b}{2a}\right)^2} = \sqrt{\frac{-4ac + b^2}{4a^2}} \\
 &x + \frac{b}{2a} = \pm \sqrt{\frac{b^2 - 4ac}{4a^2}} \\
 &x + \frac{b}{2a} = \pm \frac{\sqrt{b^2 - 4ac}}{\sqrt{4a^2}} \\
 &x + \frac{b}{2a} = \pm \frac{\sqrt{b^2 - 4ac}}{2a} \\
 &x = \pm \frac{\sqrt{b^2 - 4ac}}{2a} - \frac{b}{2a} \\
 &x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
 \end{aligned}$$



First I divided both sides of the equation by the coefficient of x^2 . Then I subtracted the constant term from both sides.

I completed the square by adding $\left(\frac{b}{2a}\right)^2$ to both sides of the equation.

I simplified on both sides.

I simplified further on the right-hand side. I found a common denominator for the two fractions on the right, then added them together.

I took the square root on either side.

I simplified and solved for x .

Bonus
I will black out a few lines to this & ask you to fill them in.!!