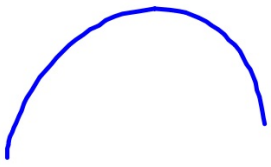
21) $h(t) = -16t^2 + 32t + 6$

$h(t) = (-16t^2 + 32t + \_\_) \_\_ + 6$

$= -16(t^2 - 2t + 1) + 16 + 6$

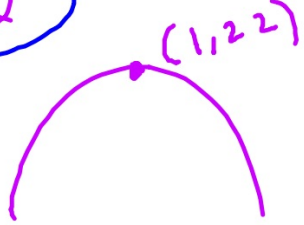
$h(t) = -16(t-1)^2 + 22$

vertex $(1, 22)$



max value

$\frac{-b}{2a}$



$$x^2 - 10x + 1 = 0$$

$a = 1$

b : even #

7.) $6x^2+6x+12=0$

$6\left(x^2+x+\frac{1}{4}\right)-\frac{3}{2}+12=0$

$x^2+x+2=0$

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

$\left(x+\frac{1}{2}\right)^2+\frac{7}{4}=0$

$\sqrt{\left(x+\frac{1}{2}\right)^2}=\sqrt{\frac{-7}{4}}$

$x+\frac{1}{2}=\pm\frac{i\sqrt{7}}{2}$

$x=-\frac{1}{2}\pm\frac{\sqrt{7}}{2}i$

8.) $3x^2 - x + 6 = 0$

$3\left(x^2 - \frac{1}{3}x + \underline{\frac{1}{36}}\right)\underline{\frac{-1}{12}} + 6 = 0$

$3\left(x - \frac{1}{6}\right)^2 + \frac{71}{12} = 0$

19.) $y = 4x^2 - 28x - 3$

$0 = 4x^2 - 28x - 3$

$0 = 4\left(x^2 - 7x + \frac{49}{4}\right) - 49 - 3$

$0 = 4\left(x - \frac{7}{2}\right)^2 - 51$

$51 = 4\left(x - \frac{7}{2}\right)^2$

$\sqrt{\frac{51}{4}} = \sqrt{\left(x - \frac{7}{2}\right)^2}$

$\pm\frac{\sqrt{51}}{2} = x - \frac{7}{2}$

$x = \frac{7}{2} \pm \frac{\sqrt{51}}{2}$

16.) $3x^2 - 12x + 4 = 0$

$3(x^2 - 4x + \underline{4}) \underline{-12} + 4 = 0$

$3(x-2)^2 - 8 = 0$

$\sqrt{(x-2)^2} = \sqrt{\frac{8}{3}}$

$x - 2 = \pm \frac{\sqrt{8}\sqrt{3}}{\sqrt{3}\sqrt{3}}$ $\frac{\sqrt{24}}{3}$

$x = 2 \pm \frac{2\sqrt{6}}{3}$

12.) $y - 4(x-6)^2 = 17$

$-1 \quad -1$

$\sqrt{(x-6)^2} = \sqrt{-4}$

$x - 6 = \pm 2i$

$x = 6 \pm 2i$

5.) $(x^2 + 12x + \underline{36}) \underline{-36} - 18 = 0$

$(x+6)^2 - 54 = 0$

$\sqrt{(x+6)^2} = \sqrt{54}$

$x + 6 = \pm 3\sqrt{6}$

$= -6 \pm 3\sqrt{6}$

1.8: Quadratic Formula and the Discriminant

$ax^2+bx+c=0$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

1) Solve using the quadratic formula.

$x^2 - 4x + 6 = 0$

$a = 1$

$b = -4$

$c = 6$

$$x = \frac{+4 \pm \sqrt{16 - 4(1)(6)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{-8}}{2} = \frac{4 \pm 2i\sqrt{2}}{2}$$

$$= \frac{4}{2} \pm \frac{2i\sqrt{2}}{2} = 2 \pm i\sqrt{2}$$

2) Solve using the quadratic formula.

$4(x - 1)^2 = 6x + 2$

$4(x^2 - 2x + 1) = 6x + 2$

$4x^2 - 8x + 4 = 6x + 2$

$4x^2 - 14x + 2 = 0$

$2x^2 - 7x + 1 = 0$

$(x-1)^2 \neq x^2 + 1$

$(x-1)(x-1)$

$a = 2$

$b = -7$

$c = 1$

$x = \frac{7 \pm \sqrt{41}}{4} =$

$\frac{7}{4} \pm \frac{\sqrt{41}}{4}$

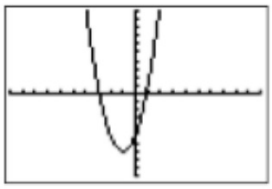
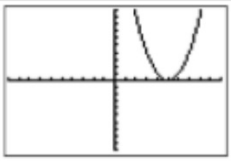
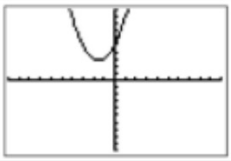
Discriminant: $b^2 - 4ac$

$D = b^2 - 4ac$

The discriminant will help you determine the number and nature of the solutions (roots) of a quadratic equation or function.

The discriminant can be positive, negative, or zero.

$ax^2 + bx + c = 0$

Value of Discriminant	Type and Number of Roots	Sample Graph of Related Function
factorable → D > 0, D is a perfect square	2 real, rational roots	
D > 0, D NOT a perfect square	2 real, Irrational roots	
factorable → D = 0	1 real, rational root (double root)	
D < 0	2 complex roots (complex conjugates)	

Find the discriminant of the quadratic equation and give the number and type of solutions of the equation.

3) $-4w^2 + w - 14 = 0$

$a = -4$

$b = 1$

$c = -14$

$D = 1^2 - 4(-4)(-14)$

$D = 1 - 224$

$D = -223$

2 complex (imaginary) solutions

4) $5x^2 + 16x = 11x - 3x^2$

$8x^2 + 5x = 0$

$a = 8$
$b = 5$
$c = 0$

$D = 5^2 - 4(8)(0)$

$D = 25$ 2 real rationals

$x(8x + 5) = 0$

$x = 0, -5/8$