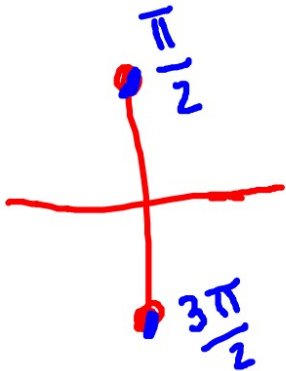


DRILL

① Describe the transformation from $f(x) = x^2$ to $g(x) = (x - \underline{8})^2 + \underline{5}$

* right 8, up 5

② Solve $\sin^2 x - 3 = -2$ $[0, 2\pi)$



$$\sqrt{\sin^2 x} = \sqrt{1}$$

$$\sin x = \pm 1$$

$$x = \frac{\pi}{2} \text{ or } \frac{3\pi}{2}$$

$$ax^2 + bx + c$$

$$a=1 \quad b=8$$

$$\text{Parabolas } \frac{8}{2} = 4$$

* Complete the square *

$$[f(x) = x^2 + 8x] + \left(\frac{8}{2}\right)^2$$

$$= x^2 + 8x + \frac{16}{2}$$

$$= (x+4)^2$$

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

$$f(x) = (x+4)^2 - 16$$

$$\text{vertex is } (-4, -16)$$

• $a=1$

x^2 must be by itself ($a=1$)

• Add $\left(\frac{b}{2}\right)^2$ to the expression

• Factor

• Subtract $\left(\frac{b}{2}\right)^2$

VERTEX FORM

$$f(x) = (x-h)^2 + k$$

(h, k) is the vertex

Ex:

$$f(x) = x^2 - 12x + 3$$

Add
 $\left(\frac{b}{2}\right)^2$

$$f(x) = \left[x^2 - 12x + 36 \right] + 3$$

Factor

$$f(x) = (x - 6)^2 + 3$$

Subtract
 $\left(\frac{b}{2}\right)^2$

$$f(x) = (x - 6)^2 + 3 - 36$$

$$f(x) = (x - 6)^2 - 33$$

vertex is
 $(6, -33)$

Ex: $f(x) = x^2 - 5x + 8$

ADD $\left(\frac{-5}{2}\right)^2 = \frac{25}{4}$

$\frac{32}{4} - \frac{25}{4} = \frac{7}{4}$

$= x^2 - 5x + \frac{25}{4} + 8$

ALWAYS
Factors
to
 $(x + \frac{b}{2})^2$

$= \left(x - \frac{5}{2}\right)^2 + 8$

Factor

$= \left(x - \frac{5}{2}\right)^2 + 8 - \frac{25}{4}$

Subtract
 $\left(\frac{b}{2}\right)^2$

$= \left(x - \frac{5}{2}\right)^2 + \frac{7}{4}$

vertex is:
 $\left(\frac{5}{2}, \frac{7}{4}\right)$