

PAP Algebra II
3.13 - Completing the Square

Name _____
Date _____ Period _____

Factor: $x^2 + 8x + 16$

$(x + 4)^2$

$4x^2 - 20x + 25$

$(2x - 5)^2$

Find the value of c that makes each trinomial a perfect square.

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

1. $x^2 - 12x + c$

$C = \left(\frac{-12}{2}\right)^2$

$C = (-6)^2$

$C = 36$

2. $x^2 + 2x + c$

$C = \left(\frac{2}{2}\right)^2$

$C = (1)^2$

$C = 1$

3. $x^2 - 8x + c$

$C = \left(\frac{-8}{2}\right)^2$

$C = (-4)^2$

$C = 16$

4. $x^2 - 5x + c$

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

$C = \frac{25}{4}$

5. $x^2 + \frac{1}{4}x + c$

$C = \left(\frac{\frac{1}{4}}{2}\right)^2$

$C = \left(\frac{1}{8}\right)^2$

$C = \frac{1}{64}$

Change each equation to vertex form ($y = a(x-h)^2 + k$) by completing the square and identify the vertex.

1. $y = x^2 + 6x + 8$

vertex: $(-3, -1)$

$y - 8 + 9 = x^2 + 6x + 9 - 9$

$y + 1 = (x + 3)^2$

$y = (x + 3)^2 - 1$

- ① Move old "c" to other side leave
- ② Find the new "c" and add it to both sides
- ③ Factor
- ④ Solve for y.

2. $y = x^2 - 14x + 19$

vertex: $(7, -30)$

$y - 19 + 49 = x^2 - 14x + 49$

$y + 30 = (x - 7)^2$

$y = (x - 7)^2 - 30$

3. $y = x^2 - 5x + 2$

vertex: $(\frac{5}{2}, -\frac{17}{4})$

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

$y + \frac{17}{4} = (x - \frac{5}{2})^2$

$y = (x - \frac{5}{2})^2 - \frac{17}{4}$

4. $y = x^2 + 9x + 18$

vertex: $(-\frac{9}{2}, -\frac{9}{4})$

$y - 18 + \frac{81}{4} = x^2 + 9x + \frac{81}{4}$

$y + \frac{9}{4} = (x + \frac{9}{2})^2$

$y = (x + \frac{9}{2})^2 - \frac{9}{4}$

5. $y = 2x^2 + 8x - 3$

vertex: $(-2, -11)$

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

$y + 3 + 8 = 2(x^2 + 4x + 4)$

$y + 11 = 2(x + 2)^2$

$y = 2(x + 2)^2 - 11$

6. $y = 3x^2 + x - 2$

vertex: $(-\frac{1}{6}, -\frac{25}{12})$

$y + 2 = 3x^2 + x$

$y + 2 + \frac{1}{12} = 3(x^2 + \frac{1}{3}x + \frac{1}{36})$

$y + \frac{24}{12} + \frac{1}{12} = 3(x + \frac{1}{6})^2$

$y + \frac{25}{12} = 3(x + \frac{1}{6})^2$

$y = 3(x + \frac{1}{6})^2 - \frac{25}{12}$