

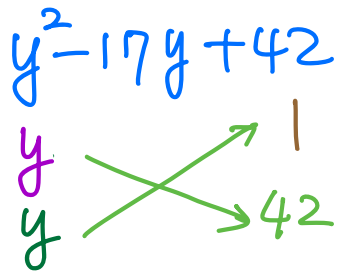
6 Classwork 6 MAT 1275 Professor Chiu

Name: _____

Completely factor:

1. $y^2 - 17y + 42$
2. $3x^2 + 7x - 6$
3. $9x^2 - 81$ and check your answer by distributing.

Sol ^{I.} ac method:



Ⓘ Split y^2 into y and y
(since $y^2 = y \cdot y$)

Ⓙ split 42 into two numbers:

- | | |
|----------------------|----------------------------|
| Ⓚ $42 = 1 \times 42$ | Ⓛ $42 = (-1) \times (-42)$ |
| Ⓜ $42 = 2 \times 21$ | Ⓨ $42 = (-2) \times (-21)$ |
| ⓐ $42 = 3 \times 14$ | Ⓩ $42 = (-3) \times (-14)$ |
| ⓑ $42 = 6 \times 7$ | ⓓ $42 = (-6) \times (-7)$ |

total 8 possibilities

ⓓ Test the 8 possibilities by doing product crossly, summing the products up, and checking if the sum matches the middle term:

- | | | | |
|--|--|--|---|
| Ⓚ $y \times y \rightarrow 42$
$42y + 1y = 43y \neq \text{middle term}$ | Ⓛ $y \times y \rightarrow 21$
$21y + 2y = 23y \neq \text{middle term}$ | Ⓜ $y \times y \rightarrow 14$
$14y + 3y = 17y \neq \text{middle term}$ | Ⓨ $y \times y \rightarrow 7$
$7y + 6y = 13y \neq \text{middle term}$ |
| ⓐ $y \times y \rightarrow (-1)$
$(-42)y + (-1)y = -43y \neq \text{middle term}$ | ⓑ $y \times y \rightarrow (-2)$
$(-21)y + (-2)y = -23y \neq \text{middle term}$ | ⓓ $y \times y \rightarrow (-3)$
$(-14)y + (-3)y = -17y = \text{middle term} \checkmark$ | |

Ⓐ in Ⓓ we found the combination ⑦ is what we want:

$$y^2 - 17y + 42$$

$$\begin{array}{l} 4 \\ y \end{array} \begin{array}{l} \nearrow (-3) \\ \searrow (-14) \end{array}$$

$$\Rightarrow -14y - 3y = -17y$$

Thus, $y^2 - 17y + 42 = (y - 3)(y - 14)$

2. ac method:

$$3x^2 + 7x - 6$$

Ⓘ split $3x^2$ into x and $3x$

$$\begin{array}{l} x \\ 3x \end{array}$$

(since $3x^2 = x \cdot 3x$)

Ⓙ split -6 into two numbers:

- | | |
|------------------------|------------------------|
| ① $-6 = 1 \times (-6)$ | ⑦ $-6 = (-1) \times 6$ |
| ② $-6 = 2 \times (-3)$ | ⑧ $-6 = (-2) \times 3$ |
| ③ $-6 = 3 \times (-2)$ | ⑨ $-6 = (-3) \times 2$ |
| ④ $-6 = (-6) \times 1$ | ⑩ $-6 = 6 \times (-1)$ |
| ⑤ $-6 = (-3) \times 2$ | ⑪ $-6 = 3 \times (-2)$ |
| ⑥ $-6 = (-2) \times 3$ | ⑫ $-6 = 2 \times (-3)$ |

total 12 possibilities.

Ⓚ Test 12 possibilities by doing products crossly, summing the products up, and check if the sum matches the middle term.

① $\begin{array}{l} x \\ 3x \end{array} \begin{array}{l} \nearrow 1 \\ \searrow (-6) \end{array}$

$$(-6)x + 1 \cdot 3x = -3x \neq \text{middle term}$$

② $\begin{array}{l} x \\ 3x \end{array} \begin{array}{l} \nearrow 2 \\ \searrow (-3) \end{array}$

$$(-3)x + 2 \cdot 3x = 3x \neq \text{middle term}$$

③ $\begin{array}{l} x \\ 3x \end{array} \begin{array}{l} \nearrow 3 \\ \searrow (-2) \end{array}$

$$(-2)x + 3 \cdot 3x = 7x = \text{middle term} \checkmark$$

Ⓛ in Ⓚ, we found combination ③ is what we want.

$$3x^2 + 7x - 6$$

$$\begin{array}{l} x \\ 3x \end{array} \begin{array}{l} \nearrow 3 \\ \searrow (-2) \end{array}$$

$$\Rightarrow -2x + 3 \cdot (3x) = -2x + 9x = 7x$$

Thus,

$$3x^2 + 7x - 6 = (x + 3)(3x - 2)$$

3. ac method $9x^2 - 81 = 9(x^2 - 9) = 9(x^2 + 0x - 9)$

↑ add a "zero" x.

Now we focus on $x^2 + 0x - 9$ first

Ⓘ Split x^2 into x and x

(since $x^2 = x \cdot x$)

Ⓜ Split -9 into two numbers:

- ① $-9 = (-1) \times 9$
 - ② $-9 = (-3) \times 3$
 - ③ $-9 = (-9) \times 1$
-) 3 possibility

Ⓝ Test 3 possibilities by doing products crossly, summing the products, and check if the sum matches the middle term.

① $x \begin{matrix} \nearrow (-1) \\ \searrow 9 \end{matrix}$
 $9 \cdot x + (-1)x = 8x \neq \text{middle term}$

② $x \begin{matrix} \nearrow (-3) \\ \searrow 3 \end{matrix}$

$3 \cdot x + (-3)x = 0x = \text{middle term} \checkmark$

Ⓞ in Ⓝ, we found the combination ② is what we want.

$9(x^2 + 0x - 9)$
 $x \begin{matrix} \nearrow (-3) \\ \searrow +3 \end{matrix} \Rightarrow 3x + (-3)x = 0x$

Thus, $9(x^2 + 0x - 9)$
 $= 9(x - 3)(x + 3)$