Warm-up 2-25

Factor the following trinomials.

1. $p^2 - 2p - 15$

2. $n^2 + 5n - 24$

4. $4n^2 - 15n - 25$

3. Let x be any real number. Then the statement $x^3 > 0$ is true for

A. $x > 0$ only.

B. $x < 0$ only.

C. no values of x.

D. all real values of x.

Warm-up 2-24

Factor the following trinomials.

1. $p^2 - 2p - 15$

$(p^2+3p)(-5p-15)$

$p(p+3)-5(p+3)$

$(p+3)(p-5)$

3. Let x be any real number. Then the statement $x^3 > 0$ is true for

A. $x > 0$ only. ✓ $(2)^3 = 8$ $(4)^3 = 64$

B. $x < 0$ only. $(-2)^2 = -8$ $(-4)^3 = -64$

C. no values of x.

D. all real values of x.

2. $n^2 + 5n - 24$

$(n^2-3n)+(8n-24)$

$n(n-3)+8(n-3)$

$(n-3)(n+8)$

24 = 4 · 6 = 2 · 2 · 2 · 3

4. $4n^2 - 15n - 25$

$(4n^2-20n)+(5n-25)$

$4n(n-5)+5(n-5)$

$(n-5)(4n+5)$

-100

$\pm 2 \cdot 50$

$\pm 20 \cdot 5$

$\pm 25 \cdot 4$

$\pm 100 \cdot 1$

$\pm 10 \cdot 10$

	n	-5
$4n$	$4n^2$	$-20n$
5	$5n$	-25

$4n^2 - 15n - 25$ ✓

Warm-up 3-5

Factor the following trinomials.

1. $p^2 - 2p - 15$

$(p+3)(p-5)$

$-15p^2$

$-5p \quad +3p$

$p^2+3p-5p-15$

$p^2-2p-15$ ✓

$-2p$

	p	3
p	p^2	$3p$
-5	$-5p$	-15

2. $n^2 + 5n - 24$

$(n-3)(n+8)$

$-24n^2$

$8n \quad -3n$

$n^2-3n+8n-24$

$n^2+5n-24$ ✓

$+5n$

	n	-3
n	n^2	$-3n$
8	$8n$	-24

3. Let x be any real number. Then the statement $x^3 > 0$ is true for

A. $x > 0$ only. ✓

~~B. $x < 0$ only.~~

~~C. no values of x.~~

~~D. all real values of x.~~

$(4)^3 = 64 > 0$ ✓

$(2)^3 = 8 > 0$ ✓

$(-5)^3 = -125 > 0$ no

4. $4n^2 - 15n - 25$

$-100n^2$

$-20n \quad 5n$

$-15n$

	$4n$	5
n	$4n^2$	$5n$
-5	$-20n$	-25

$(4n+5)(n-5)$

$4n^2-20n+5n-25$

$4n^2-15n-25$ ✓

$7x^2+15x+2$

$7(2)$

14

$2 = \frac{14}{7}$ $\quad \frac{1}{7}$

15

$(x+2)(x+\frac{1}{7})$

$(x+2)(7x+1)$

$3x^2-19x+20$ $\qquad ax^2+bc+c$

$3(20)$

60

$-5 = \frac{-15}{3}$ $\quad \frac{-4}{3}$

-19

$(x-5)(x-\frac{4}{3})$

$(x-5)(3x-4)$

60
30·2
3·20
15·4 ✓

$3x^2-19x+20$

60

$-5 = \frac{-15}{3}$ $\quad \frac{-4}{3}$

-19

$(x-\frac{5}{1})(x-\frac{4}{3})$

$(x-5)(3x-4)$

60
X 6·10
X 3·20
X 12·5
-15(-4)

	$2x$	-1
x	$2x^2$	$-x$
-2	$-4x$	2

$2x^2-x-4x+2$

$2x^2-5x+2$ $\quad a=2$ $\quad b=-5$ $\quad c=2$

4

$\frac{-1}{2}$ $\quad \frac{-4}{2}=-2$

-5

$(2x-1)(x-2)$

4
2·2
-1(-4)

Examples

$3n^2 - 8n + 4$

$5x^2 + 19x + 12$

$2m^2 + 5m + 2$

$7a^2 + 53a + 28$

$9k^2 + 66k + 21$

Examples

$3n^2 - 8n + 4$

$a=3$
$b=-8$
$c=4$

$-2 = \frac{-6}{3} \times \frac{-2}{3}$ (12, -8)

$(n-2)(n-\frac{2}{3})$

$(n-2)(3n-2)$

$5x^2 + 19x + 12$

$a=5$
$b=19$
$c=12$

$3 = \frac{15}{5} \times \frac{4}{5}$ (60, 19)

2,30
6,10
3,20
15,4

$(x+3)(x+\frac{4}{5})$

$(x+3)(5x+4)$

$2m^2 + 5m + 2$

$(2m+1)(m+2)$ $2 = \frac{4}{2} \times \frac{1}{2}$ (4, 5)

$(m+\frac{1}{2})(m+2)$

$7a^2 + 53a + 28$

$(a+7)(7a+4)$

196, $\frac{4}{7} \times \frac{49}{7} = 7$, 53

$(a+\frac{4}{7})(a+7)$

$9k^2 + 66k + 21$

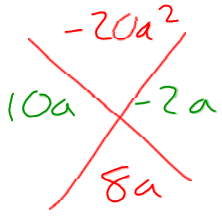
$(k+7)(9k+3)$

189, $\frac{3}{9} \times \frac{63}{9} = 7$, 66

$(3k+1)(k+7)$
$3k^2+k+21k+7$

$4a^2 + 8a - 5$

$(2a-1)(2a+5)$

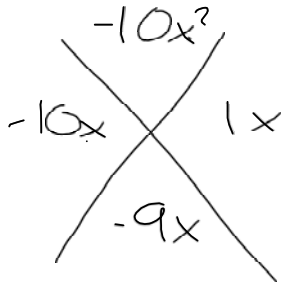


	$2a$	-1
$2a$	$4a^2$	$-2a$
5	$10a$	-5

20

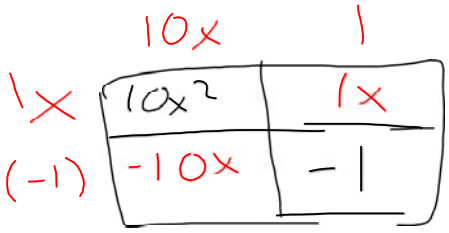
$2(10)$

17. $10x^2 - 9x = 1$



10

$(-10)(1)$



$(10x+1)(x-1)$

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

$10x^2 - 9x - 1$ ✓

$2x(x-4)+3(-x+4)$

$2x(x-4)-3(x-4)$

$(x-4)(2x-3)$

Today's Goal

I can identify and factor *special* polynomials

$$8x^2-12x-8$$

$2 \cdot 2 \cdot 2 \cdot x \cdot x$

$- 2 \cdot 2 \cdot 3 \cdot x$

$- 2 \cdot 2 \cdot 2$

$4(2x^2-3x-2)$

$4(x-2)(2x+1)$

$2x^2-3x-2$

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

$2 \cdot x \cdot x \quad 1 \cdot x$

$-2 \cdot 2 \cdot x \quad -2$

$2x(x-2)+1(x-2)$

$(x-2)(2x+1)$

-4, $\times$, -4, 1, $+$, -3

$$10x^2 - 25x - 125$$

$10x^2-25x-125$

$5 \overline{)125}$
$5 \overline{)25}$
5

$2 \cdot 5 \cdot x \cdot x$
$-5 \cdot 5 \cdot x$
$-5 \cdot 5 \cdot 5$

$5(2x^2-5x-25)$

$2x^2-5x-25$

-50
$-10 \quad 5$
-5

$(2x^2-10x)+(5x-25)$

$2 \cdot x \cdot x$
$-2 \cdot 5 \cdot x$

$5 \cdot x$
$-5 \cdot 5$

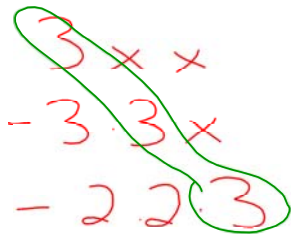
$2x(x-5)+5(x-5)$

$(x-5)(2x+5)$

$5(x-5)(2x+5)$

$$3x^2-9x-12$$

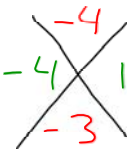
$$3x^2-9x-12$$



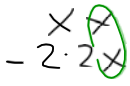
$3(x^2-3x-4)$

$3(x-4)(x+1)$

x^2-3x-4



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



$x(x-4)+1(x-4)$

$(x-4)(x+1)$

Section 9.5: Factoring Special Products

Perfect Square Trinomial

$a^2 + 2ab + b^2 = (a + b)(a + b)$ or $(a + b)^2$

	a	b
a	a^2	ab
b	ab	b^2

$a^2+2ab+b^2$

$a^2 - 2ab + b^2 = (a - b)(a - b)$ or $(a - b)^2$

	a	-b
a	a^2	$-ab$
-b	$-ab$	b^2

$a^2-2ab+b^2$

Examples

Determine whether each trinomial is a perfect square. If so, factor. If not, explain why not.

(+)^2 (−)^2

$x^2 + 4x + 4$

$(x)^2$ $(2)^2$

$2(x)(2)$

$4x$ ✓

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

$x^2 - 14x + 49$

$(x)^2$ $(7)^2$

$2(x)(7)$

$14x$ ✓

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

$9x^2 - 6x + 4$

$(3x)^2$ $(2)^2$

$2(3x)(2)$

$12x$ ✗

Try These!!!

Determine whether each trinomial is a perfect square. If so, factor. If not, explain why not.

1. $9x^2 - 15x + 64$

$(3x)^2$ $(8)^2$

$2(3x)(8)$

$48x$ ✗

576

-15

2. $81x^2 + 90x + 25$

$(9x)^2$ $(5)^2$

$2(9x)(5)$

$90x$ ✓

2025

90

$(9x + 5)^2$

$= (9x+5)(9x+5)$

3. ~~$4x^4 - 20x^2z + 25z^2$~~

Try These!!!

Determine whether each trinomial is a perfect square. If so, factor. If not, explain why not.

1. $9x^2 - 15x + 64$

2. $81x^2 + 90x + 25$

$(9x)^2$ $(5)^2$

$2(9x)(5)$

$90x$ ✓

$(9x + 5)^2$

$2025x^2$

$90x$

3. $4x^4 - 20x^2z + 25z^2$

$(2x^2)^2$ $(5z)^2$

$2(2x^2)(5z)$

$20x^2z$ ✓

$(2x^2 - 5z)^2$

$+0x$

$x^2 - 25$

$(x^2 + 5x)(-5x - 25)$

$x \cdot x$, $5 \cdot x$, $-5 \cdot 5x$, $-5 \cdot 5$

$x(x+5) - 5(x+5)$

$(x+5)(x-5)$

-25

5×-5

0

Difference of Two Squares

$a^2 - b^2 = (a + b)(a - b)$

	a	b
a	a^2	~~ab~~
-b	~~-ab~~	$-b^2$

$a^2 - b^2$

$x^2 - 81$

$(x)^2 \quad (9)^2$

$(x+9)(x-9)$

$m^2 - 16$

$(m)^2 \quad (4)^2$

$(m+4)(m-4)$

~~$f^4 + 25$~~

~~$(f^2)^2 \quad (5)^2$~~

$9p^4 - 16q^2$

$(3p^2)^2 \quad (4q)^2$

$(3p^2+4q)(3p-4q)$

Examples

Determine whether the binomial is a difference of two squares. If so, factor. If not, explain.

$1 - 4x^2$

$(1)^2 \quad (2x)^2$

$(1+2x)(1-2x)$

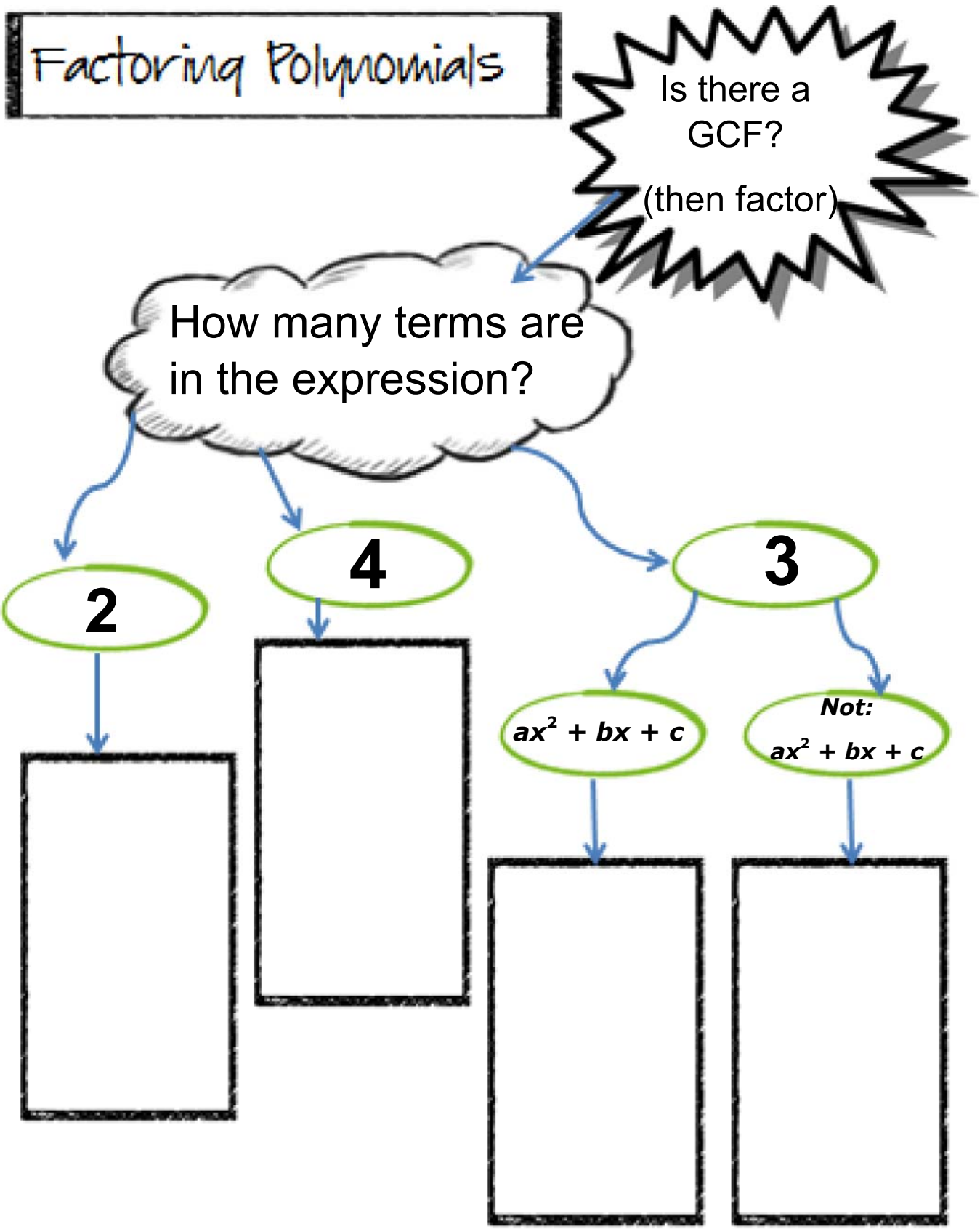
$x^2 - 49$

$(x)^2 \quad (7)^2$

$(x+7)(x-7)$

~~$p^8 - 49q^6$~~

~~$16x^2 + 4y^5$~~


Factoring Polynomials
Is there a GCF?
(then factor)
How many terms are in the expression?
2
4
3
$ax^2 + bx + c$
Not:
$ax^2 + bx + c$

Factoring Polynomials

Is there a GCF? (then factor)

How many terms are in the expression?

2

Difference of squares.

$a^2 - b^2 = (a+b)(a-b)$

4

Grouping

First 2 and last 2.

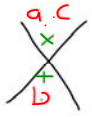
Factor out GCF.

Check binomial for the same #'s

3

$ax^2 + bx + c$

"X-Grouping"



*If large #'s, use perfect square.

Not:

$ax^2 + bx + c$

Perfect Square

$a^2 \pm 2ab + b^2$

$(a \pm b)^2$

X #11 $2x - 2xy^2$

$-(2)(x)yy$

$2x(1-y^2)$

$1 - y^2$

$(1)^2 - (y)^2$

$(1+y)(1-y)$

$2x(1+y)(1-y)$

XI

#13 $16d^8 - 8d^4 + 1$

$(4d^4)^2$ $(1)^2$

$2(4d^4)(1)$

$8d^4$ ✓

$(4d^4 - 1)^2$

X

#12

$3t^3 - 27t$

$3t(t^2-9)$

$t^2 - 9$

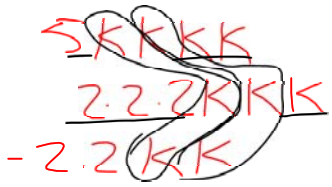
$(t)^2 - (3)^2$

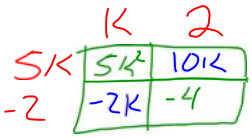
$(t+3)(t-3)$

$3t(t+3)(t-3)$

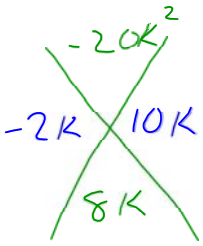
XI

#5 $5k^4 + 8k^3 - 4k^2$





$k^2(5k^2 + 8k - 4)$



$k^2(5k-2)(k+2)$

Homework

Factoring Foldable (solve the 2nd one from each section)

Warm-up 2-27

Factor the following trinomials.

1. $3p^2 - 2p - 5$

2. $12b^3 + 48b^2 + 48b$

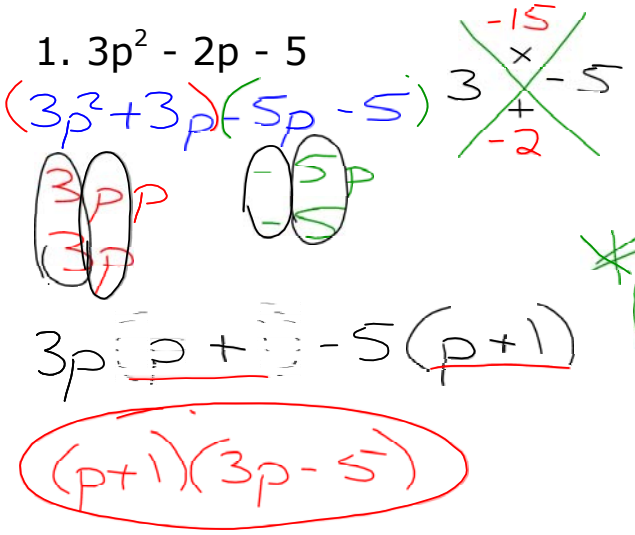
3. $x^2 - 14x + 49$

4. $100x^2 - 4y^2$

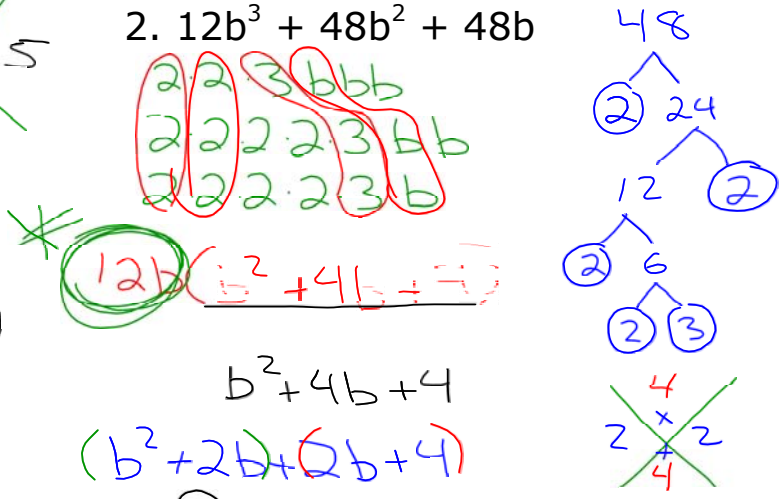
Warm-up 2-26

Factor the following trinomials.

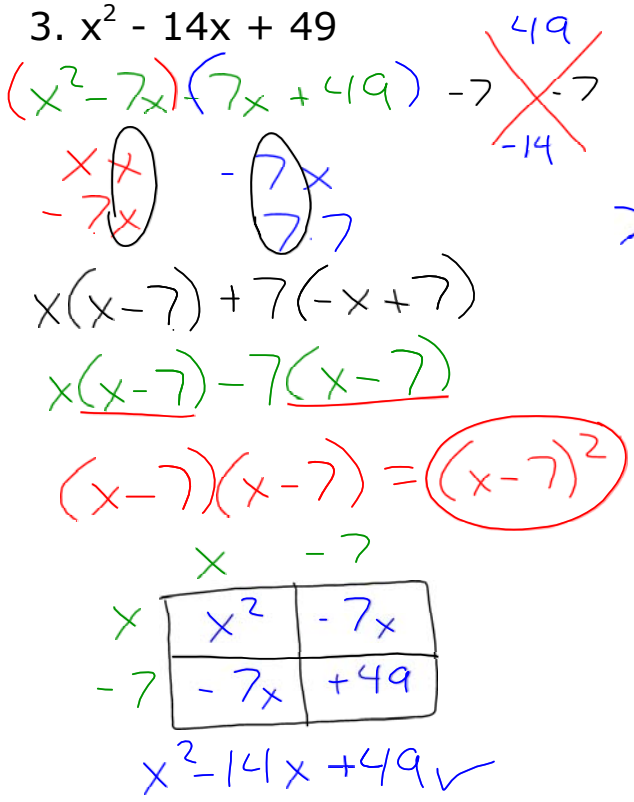
1. $3p^2 - 2p - 5$



2. $12b^3 + 48b^2 + 48b$



3. $x^2 - 14x + 49$



4. $100x^2 - 4y^2$