14.) $\dfrac{5b^5 \cdot \cancel{b^1} b^3}{-2\cancel{b^{-3}} \cdot 5b^0 b^1}$

$\dfrac{5b^8}{-10b^1}$

$\dfrac{1b^7}{-2} = \dfrac{b^7}{-2}$

19.) $\dfrac{(-2u^3v^{-5})^4}{(-2u)^{-5}}$

$16u^{12}v^{-20}(-2u)^5$

$\dfrac{16u^{12}\cancel{v^{-20}}(-32)u^5}{v^{20}}$

$\dfrac{-512u^{17}}{v^{20}}$

$$(x+5)-(3x-1)$$

$$x+5-3x+1$$

$$-2x+6$$

Multiplying Polynomials/Factoring Bootcamp 2

Consider the following functions:

$$a(x) = -2x \qquad b(x) = x^2 - 3x - 5$$
$$c(x) = 3x^4 + 5x^2 \qquad d(x) = 2x^2 - x$$

Multiply then simplify.

a) a(x)b(x)

$-2x(x^2 - 3x - 5)$

$-2x^3 + 6x^2 + 10x$

Consider the following functions:

$$a(x) = -2x \qquad b(x) = x^2 - 3x - 5$$
$$c(x) = 3x^4 + 5x^2 \qquad d(x) = 2x^2 - x$$

Multiply then simplify.

b) **b(x)+a(x)d(x)**

$(x^2-3x-5)+(-2x)(2x^2-x)$

$1x^2-3x-5-4x^3+2x^2=-4x^3+3x^2-3x-5$

Consider the following functions:

$$a(x) = -2x \qquad b(x) = x^2 - 3x - 5$$
$$c(x) = 3x^4 + 5x^2 \qquad d(x) = 2x^2 - x$$

Multiply then simplify.

c) *a(x)c(x)*

$-2x(3x^4+5x^2)$

$-6x^5-10x^3$

Consider the following functions:

$(a+b)^2 \neq a^2+b^2$

$a(x) = -2x$ $\qquad$ $b(x) = x^2 - 3x - 5$

$c(x) = 3x^4 + 5x^2$ $\qquad$ $d(x) = 2x^2 - x$

$(3+1)^2 \neq 3^2+1^2$

$4^2 \neq 10$

Multiply then simplify.

d) $[c(x)]^2$

$(3x^4+5x^2)^2 = (3x^4+5x^2)(3x^4+5x^2)$

$= 9x^8 + \underline{15x^6} + \underline{15x^6} + 25x^4$

$9x^8 + 30x^6 + 25x^4$

Consider the following functions:

$$a(x) = -2x \qquad b(x) = x^2 - 3x - 5$$
$$c(x) = 3x^4 + 5x^2 \qquad d(x) = 2x^2 - x$$

Multiply then simplify.

e) b(x)d(x) $(x^2 - 3x - 5)(2x^2 - x)$

$$\begin{array}{r|l} & x^2 - 3x - 5 \\ \hline 2x^2 & 2x^4 - 6x^3 - 10x^2 \\ -x & -x^3 + 3x^2 + 5x \end{array}$$

$2x^4 - 7x^3 - 7x^2 + 5x$

Consider the following functions:

$$a(x) = -2x \qquad b(x) = x^2 - 3x - 5$$

$$c(x) = 3x^4 + 5x^2 \qquad d(x) = 2x^2 - x$$

Multiply then simplify.

f) b(x)c(x)

$$x^2 - 3x - 5$$

$$3x^4 \qquad 3x^6 - 9x^5 - 15x^4$$

$$5x^2 \qquad 5x^4 - 15x^3 - 25x^2$$

$$3x^6 - 9x^5 - 10x^4 - 15x^3 - 25x^2$$

Review: Factor completely.

a) x^2-9 $(x-3)(x+3)$	b) $x^2-3x-10$ $(x-5)(x+2)$	c) $9x^2+12x+4$ $(3x+2)(3x+2)$
d) $2x^2+32$ $2(x^2+16)$	e) $x^3-3x^2-16x+48$ $x^2(x-3)-16(x-3)$ $(x^2-16)(x-3)$ $(x+4)(x-4)(x-3)$	f) x^3+3x^2-2x-6 $x^2(x+3)-2(x+3)$ $(x+3)(x^2-2)$

Perfect Cubes

$1^3 = 1$

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

$5^3 = 125$

$6^3 = 216$

$10^3 = 1000$

Sum/Difference of Cubes

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

Remembering the SIGNS in the Cubes Formula

$$a^3+b^3=(a+b)(a^2-ab+b^2)$$

$$a^3-b^3=(a-b)(a^2+ab+b^2)$$

$\boxed{\text{SOAP}}$

S - same sign

O - opposite sign

AP - always positive

Factor completely.

SOAP

a) $x^3 + 27 = (x + 3)(x^2 - 3x + 9)$

$a = x$
$b = 3$

SOAP

b) $x^3 - 8 = (x - 2)(x^2 + 2x + 4)$

$a = x$
$b = 2$

Factor completely.

c) $64 - x^3 = (4-x)(16+4x+x^2)$

$(a \quad b)(a^2 \quad ab \quad b^2)$

$a = 4$

$b = x$

d) $8x^3 + 125$ $(2x+5)(4x^2-10x+25)$ $a^2 = (2x)^2$

$a = 2x$

$b = 5$

Factor completely.

e) $125x^3 - 27 = (5x - 3)(25x^2 + 15x + 9)$

$a = 5x$

$b = 3$

f) $24x^3 + 3$

$3(8x^3 + 1) = 3(2x + 1)(4x^2 - 2x + 1)$

$a = 2x$

$b = 1$

Quadratic Form

$$ax^{2n} + bx^{n} + c$$

Factor completely.

a) $x^2+7x+10$	b) x^4+7x^2+10	c) x^6+7x^3+10
$(x+5)(x+2)$	$(x^2+5)(x^2+2)$	$(x^3+5)(x^3+2)$

Factor completely.

b) $x^4 - x^2 - 12 = (x^2-4)(x^2+3)$

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

a) $x^4 - 2x^2 - 15 = (x^2-5)(x^2+3)$

Factor completely.

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

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

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

d) $2x^4 + 7x^2 + 6$

$(2x^2 + 1)(x^2 + 6)$

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

Factor completely.

e) $2x^5 + 8x^3 - 10x = 2x(x^4 + 4x^2 - 5)$

$2x(x^2 - 1)(x^2 + 5)$

$2x(x-1)(x+1)(x^2+5)$

f) $8x^6 - 5x^3 - 3$

Factor completely.

g) $16x^4 - 24x^2 + 9$

h) $16x^4 - 30x^2 + 9$

Factor completely.

i) $\underbrace{x^5 - x^3} + \underbrace{64x^2 - 64}$

$x^3(x^2-1) + 64(x^2-1)$

don't stop!

$(x^2-1)(x^3+64)$ $\leftarrow$ $a = x$, $b = 4$

$(x+1)(x-1)(x+4)(x^2-4x+16)$