Warm Up

- Are the following polynomial functions? If so, write the function in standard form and state its degree, type, constant and leading coefficient.
- 1. $f(x) = 3x^5 + 7x^2 - 5$
- 2. $f(x) = 2^x + 3^{x^2}$
- 3. $f(x) = 5$

Unit 9
Polynomial Functions
Lesson 2
Finding zero

Today

- **SWBAT…**find the zeros of a polynomial function and draw a rough graph.
- **A-SSE.B.3a** Students will factor quadratic expressions and find the zeros of the quadratic function it represents. Explain the meaning of the zeros as they relate to the context of the problem.
- **A-APR.B.3** Students will identify relationship between zeros and factors of polynomials. Identify zeros and/or factors of polynomials. Use zeros to construct a rough graph of the function defined by the polynomial.

Definitions

- **Zero-product property** – anything times zero is zero
- **Factored Form** – when a problem is written as a bunch of binomials in a row $-(x+3)(x-2)(x+4)$ …
- **Zero (for graphing sake)** – x-intercepts

You have to know degrees

Degree	Name
0	Constant
1	Linear
2	Quadratic
3	Cubic (cubed)
4	Quartic
Bigger	Polynomial

Graphing

Degree	LC	SHAPE	$f(x)$ as x APPROACHES $-\infty$	$f(x)$ as x APPROACHES ∞
EVEN	POSITIVE	U	∞	∞
EVEN	NEGATIVE	n	$-\infty$	$-\infty$
ODD	POSITIVE		$-\infty$	∞
ODD	NEGATIVE		∞	$-\infty$

Find the Zeros and draw a rough sketch

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

Find the Zeros and draw a rough sketch

- $f(x) = (2x + 1)(3x - 2)(x - 1)$

Find the Zeros and draw a rough sketch

- $f(x) = (x + 5)^2$

Find the Zeros and draw a rough sketch

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

Find the Zeros

- Type equation here.

1. $(x + 1)(x + 6) = 0$
2. $(t + 4)(t - 4) = 0$
3. $(x + 9)(x - 8) = 0$
4. $(c + 7)(c + 2) = 0$
5. $(n - 8)(n - 9) = 0$
6. $(x + 4.2)(x - 4.2) = 0$
7. $\left(d + \frac{3}{4}\right)\left(d + \frac{5}{8}\right) = 0$
8. $\left(x + \frac{1}{2}\right)\left(x - \frac{1}{2}\right) = 0$
9. $(x + 5.4)(x - 3) = 0$
10. $5(m + 4)^2 = 0$
11. $(x - 3.2)\left(w - \frac{3}{2}\right) = 0$
12. $(y - 6)(y + 6)^2 = 0$

Solve the equation.

13. $(2x + 8)(x + 7) = 0$
14. $(5y - 1)(2y + 4) = 0$
15. $(4m + 16)(3m - 18) = 0$
16. $(2n - 7)(5n + 20) = 0$
17. $(2x - 5)(9x - 15) = 0$
18. $(7t + 21)(t + 9) = 0$
19. $(5x + 7)(7x - 15) = 0$
20. $(2c + 8)(5c + 10) = 0$
21. $(2w - 6.4)(4w - 8.4) = 0$
22. $(3x + 9.3)(4x - 12.8) = 0$
23. $\left(2x - \frac{1}{2}\right)\left(2x + \frac{1}{2}\right)^2 = 0$
24. $\left(5n + \frac{1}{3}\right)\left(3n - \frac{1}{2}\right) = 0$

Homework

- Worksheet

Warm Up

- What are the factor pairs of the following numbers (LIST ALL POSSIBILITIES)
- 1. 10
- 2. 16
- 3. 25

Warm Up

- Factor the trinomial
- 1. $x^2 - 15x + 36$
- 2. $3x^2 + 15x - 36$

Unit 9
Polynomial Functions
Lesson 3
Factoring Polynomials

Today

- **SWBAT...**factor a polynomial
- **A-SSE.B.3a** Students will factor quadratic expressions and find the zeros of the quadratic function it represents. Explain the meaning of the zeros as they relate to the context of the problem.
- **A-SSE.A.2** Students will rewrite algebraic expressions in different equivalent forms such as factoring or combining like terms. Use factoring techniques such as common factors, grouping, the difference of two squares, or a combination of methods to factor completely. Simplify expressions including combining like terms, using the distributive property and the other operations with polynomials.

I DO (basic)

Factor

- 1. $f(x) = x^2 - 12x - 28$
- 2. $f(x) = x^2 + 3x - 18$
- 3. $f(x) = x^2 - x - 6$
- 4. $f(x) = x^2 + x - 2$

Directions (Basic) means a=1

WE DO (basic)

Factor

- 1. $f(x) = x^2 - 16$
- 2. $f(x) = x^2 - 25$
- 3. $f(x) = x^2 + 4x + 4$
- 4. $f(x) = x^2 - 6x + 9$

YOU DO (basic)

Factor and find the zeros

- 1. $f(x) = x^2 - 3x + 2$
- 2. $f(x) = x^2 - 4$
- 3. $f(x) = x^2 + 7x + 12$
- 4. $f(x) = x^2 + 2x - 35$

I DO (medium)

Factor

1. $y = 2x^2 + 4x + 2$
- 2. $y = 3x^2 - 9x + 6$
- 3. $y = 5x^2 - 30x - 35$
- 4. $y = 2x^2 + 6x - 20$

Directions (medium) means a ≠ 1

WE DO (medium)

Factor

- 1. $y = 10x^2 + 60x + 50$
- 2. $y = 7x^2 - 35x + 42$
- 3. $y = 6x^2 - 54x - 60$
- 4. $y = 4x^2 + 24x - 28$

YOU DO (medium)

Factor and find the zeros

- 1. $y = 2x^2 + 2x - 24$
- 2. $y = 5x^2 + 5x - 10$
- 3. $y = 6x^2 - 36$
- 4. $y = 2x^2 - 12x + 16$

I DO (Advanced)

Factor

- 1. $y = 3x^2 - 17x + 10$
- 2. $y = 4x^2 - 25$
- 3. $y = 2x^2 + 7x + 3$
- 4. $y = 5x^2 - 7x + 2$

Directions (ADVANCED) means a ≠ 1

WE DO (Advanced)

Factor

- 1. $y = 3x^2 + 32x - 11$
- 2. $y = 7x^2 - 4x - 3$
- 3. $y = 3x^2 + 17x + 10$
- 4. $y = 6x^2 - 9x + 5$

YOU DO (Advanced)

Factor and find the zeros

- 1. $y = 3x^2 - 17x + 10$
- 2. $y = 4x^2 - 25$
- 3. $y = 2x^2 + 7x + 3$
- 4. $y = 5x^2 - 7x + 2$

MIX IT UP

- Factor and find the zeros
- 1. $f(x) = x^2 - x - 72$
- 2. $f(x) = 8x^2 + 18x - 18$
- 3. $f(x) = 16x^2 - 16x - 32$
- 4. $f(x) = x^2 - 10x + 24$

MIX IT UP

- Factor and find the zeros
- 1. $f(x) = 12x^2 - 10x - 8$
- 2. $f(x) = 15x^2 + 30x + 15$
- 3. $f(x) = x^2 + x - 30$
- 4. $f(x) = 4x^2 - 4x - 35$

MIX IT UP

- Factor and find the zeros
- 1. $f(x) = 10x^2 + 36x - 16$
- 2. $f(x) = x^2 - 4x - 21$
- 3. $f(x) = 5x^2 + 20x - 60$
- 4. $f(x) = 2x^2 - 8$

Factoring Practice

I. Greatest Common Factor (GCF)

Find the GCF of the numbers.

$$18,\ 30$$
$$18 = 2 \cdot 3 \cdot 3$$
$$30 = 2 \cdot 3 \cdot 5$$
$$2 \cdot 3 = 6$$
$$6 = GCF$$

1. 12, 18
2. 10, 35
3. 8, 30
4. 16, 24
5. 28, 49
6. 27, 63
7. 30, 45
8. 48, 72

II. Greatest Common Monomial Factor

Factor, write prime if prime.

$$12a^3b + 15ab^3 = 3ab(4a^2 + 5b^2)$$

1. $6x + 3$
2. $24x^2 - 8x$
3. $6x - 12$
4. $2x^2 + 8x$
5. $4x + 10$
6. $10x^2 + 35x$
7. $10x^2y - 15xy^2$
8. $12x^2 - 9x + 15$
9. $3n^3 - 12n^2 - 30n$
10. $9m^2 - 4n + 12$
11. $2x^3 - 3x^2 + 5x$
12. $13m + 26m^2 - 39m^3$
13. $17x^2 + 34x + 51$
14. $18m^2n^4 - 12m^2n^3 + 24m^2n^2$

III. Factoring the Difference of Two Squares

$$a^2 - 36 = (a + 6)(a - 6)$$
$$3x^2 - 48 = 3(x^2 - 16) = 3(x + 4)(x - 4)$$

Factor, write prime if prime.

1. $x^2 - 1$
2. $x^2 - 9$
3. $x^2 + 4$
4. $x^2 - 25$
5. $9y^2 - 16$
6. $4x^2 - 25$
7. $9x^2 - 1$
8. $a^2 - x^2$
9. $25 - m^2$
10. $x^2 - 16y^2$
11. $25m^2 - n^2$
12. $-x^2 + 16$
13. $36m^2 - 121$
14. $2x^2 - 8$
15. $25 + 4x^2$
16. $4a^2 - 81b^2$
17. $12x^2 - 75$
18. $a^2b - b^3$
19. $-98 + 2x^2$
20. $5x^2 - 45y^2$
21. $9x^4 - 4$
22. $16x^4 - y^2$

IV. Factoring Perfect Square Trinomials

$$x^2 - 14x + 49 = (x-7)^2$$

Factor, write prime if prime.

1. $x^2 + 8x + 16$
2. $x^2 - 16x + 64$
3. $y^2 + 12y + 36$
4. $a^2 - 10a + 25$
5. $16y^2 + 8y + 1$
11. $25a^2 + 60a + 36$
12. $16 + 40x + 25x^2$
13. $16x^2 + 24x + 9$
14. $49x^2 - 14x + 1$
15. $9y^2 - 30y + 25$
6. $9x^2 - 6x + 1$
7. $25x^2 + 10x + 1$
8. $n^2 - 14n + 49$
9. $81x^2 - 90x + 25$
10. $4y^2 - 20y + 25$
16. $n^2 + 2n + 4$
17. $b^2 + 2b + 1$
18. $36x^2 + 84x + 49$
19. $81 - 18x + x^2$
20. $4 - 12y + 9y^2$

V. Special Factoring - Challenge

Factor, write prime if prime.

1. $a^2 - 36$
2. $9x^2 - 49$
3. $169m^2 - 4u^2$
4. $x^2y^2 - 9z^4$
5. $\frac{1}{4}x^2 - 25y^2$
6. $\frac{1}{9}x^2 - 16$
7. $64 - a^4b^4$
8. $y^6 - 100$
9. $\frac{4}{9}x^2y^2 - \frac{25}{36}z^2$
10. $y^8 - 81$
11. $1 - 8u + 16u^2$
12. $a^2b^2 + 6ab + 9$
13. $x^2 + 2xy + y^2$
14. $4x^2 + 12xy + 9y^2$
15. $100h^2 + 20h + 1$
16. $9a^2 - 24a + 16$
17. $4a^3 + 8a^2 + 4a$
18. $5c + 20c^2 + 20c^3$
19. $(x+4)^2 - (y+1)^2$
20. $(x-1)^2 - 10(x-1) + 25$

VI. Factoring Trinomials: $x^2 + bx + c$

$$x^2 + 7x + 10 = (x)^2 + (2+5)x + (2)(5) = (x+2)(x+5)$$

Factor, write prime if prime.

1. $x^2 + 6x + 8$
2. $c^2 + 5c + 6$
3. $y^2 - 9y + 14$
4. $x^2 - 10x + 16$
5. $a^2 + 12a + 27$
6. $x^2 - 14x + 24$
7. $x^2 - 15x + 36$
8. $y^2 + 21y + 54$
9. $m^2 + 13m - 36$
10. $x^2 - 8x + 15$
11. $y^2 - 4y - 32$
12. $x^2 - x - 6$
13. $y^2 + 3y - 18$
14. $b^2 + 7b - 18$
15. $a^2 + a - 56$
16. $c^2 - 4c - 12$
17. $x^2 - 9x - 36$
18. $y^2 + 4y - 21$
19. $x^2 - 22x - 75$
20. $x^2 - 3x - 40$
21. $45 + 14y + y^2$
22. $x^2 - 13x + 36$

VII. ...More Factoring Trinomials: $x^2 + bx + c$

$$\boxed{k^2 - k - 20 = (k)^2 + (4 + -5)k + (4)(-5) = (k+4)(k-5)}$$

Factor, write prime if prime.

1. $x^2 + 7x + 12$
2. $m^2 + 10m + 21$
3. $y^2 - 7y - 8$
4. $x^2 - 6x + 5$
5. $x^2 + 4x - 32$
6. $x^2 - 2x - 15$
7. $x^2 - 6x + 8$
8. $y^2 + 9y + 18$
9. $3 - 4t + t^2$
10. $v^2 + 12v + 20$
11. $51 - 20k + k^2$
12. $a^2 - 14ab + 24b^2$
13. $y^2 + 6y - 72$
14. $x^2 - 11xy - 60y^2$
15. $15r^2 + 2rs - s^2$
16. $3x^2 + 21xy - 54y^2$ (Hint: Check for GCF)
17. $x^2 - 5xy - 6y^2$
18. $x^2 + 8xy + 12y^2$
19. $y^2 - 7xy + 10x^2$
20. $a^2 - 11ab - 60b^2$

VIII. Factoring Trinomials: $ax^2 + bx + c$

$$\boxed{2x^2 - 5x - 3 = (2x+1)(x-3)}$$

Factor, write prime if prime.

1. $2x^2 - 5x - 3$
2. $3x^2 + 10x - 8$
3. $2y^2 + 15y + 7$
4. $7a^2 - 11a + 4$
5. $5n^2 + 17n + 6$
6. $4y^2 + 8y + 3$
7. $3x^2 + 4x - 7$
8. $2x^2 + 13x + 15$
9. $9y^2 + 6y - 8$
10. $6x^2 - 7x - 20$
11. $2n^2 - 3n - 14$
12. $5n^2 + 2n + 7$
13. $10x^2 + 13x - 30$
14. $12y^2 + 7y + 1$
15. $2n^2 + 9n - 5$
16. $2x^2 + 7x + 6$
17. $5a^2 - 42a - 27$
18. $15x^2 - 28x - 32$
19. $8a^2 - 10a + 3$
20. $2y^2 - 3y - 20$

IX. ...More Factoring Trinomials: $ax^2 + bx + c$

Factor, write prime if prime.

1. $3x^2 + 4x + x$
2. $5z^2 + 7z + 2$
3. $2n^2 - 11n + 5$
4. $3z^2 + z - 2$
5. $5h^2 - 2h - 7$
6. $8s^2 - 10st + 3t^2$
7. $6x^2 + 19x + 15$
8. $28a^2 + 5ab - 12b^2$
9. $2a^2 + 7ab - 15b^2$
10. $12x^2 + 17x + 6$
11. $4a^2 - 4ab - 5b^2$
12. $56y^2 + 15y - 56$
13. $12x^2 - 29xy + 14y^2$
14. $64x^2 + 32xy - 21y^2$
15. $16x^2 + 56xy + 49y^2$
16. $18x^2 - 57x + 35$

X. Factoring: Putting It All Together

$$5x^2 + 20x - 60 = 5(x^2 + 4x - 12) = 5(x+6)(x-2)$$

Factor Completely, write prime if prime.

1. $2x^2 - 8$
2. $2x^2 + 8x + 6$
3. $3n^2 + 9n - 30$
4. $6x^2 - 26x - 20$
5. $2x^2 + 12x - 80$
6. $5t^2 + 15t + 10$
7. $8n^2 - 18$
8. $14x^2 + 7x - 21$
9. $4x^2 + 16x + 16$
10. $18x + 12x^2 + 2x^3$
11. $2x - 2xy^2$
12. $3t^3 - 27t$
13. $24a^2 - 30a + 9$
14. $10x^2 + 15x - 10$
15. $3x^2 - 42x + 147$
16. $4x^4 - 4x^2$

XI. ...More Factoring: Putting It All Together

1. $16x^2 - 40x - 24$
2. $27x^2 - 36x + 12$
3. $5x^2 - 60x - 140$
4. $6m^3 + 54m^2 - 6m$
5. $5k^4 + 8k^3 - 4k^2$
6. $x^2y^4 - x^6$
7. $y^4 - 6y^2 - 16$
8. $x^4 - 3x^2 - 4$
9. $h^2 - (a^2 - 6a + 9)$
10. $81x^4 - 16y^4$
11. $4mn^2 - 4m^2n^2 + m^3n^2$
12. $(2a+3)^2 - (a-1)^2$
13. $16d^8 - 8d^4 + 1$
14. $x^2(x^2-4) + 4x(x^2-4) + 4(x^2-4)$

XII. Extra: Factoring by Grouping

$$\begin{aligned} 6ax - 2b - 3a + 4bx &= 6ax - 3a + 4bx - 2b \\ &= 3a(2x-1) + 2b(2x-1) \\ &= (2x-1)(3a+2b) \end{aligned}$$

1. $x^2 + 2x + xy + 2y$
2. $3a^2 - 2b - 6a + ab$
3. $t^3 - t^2 + t - 1$ Hint: $t - 1 = 1(t-1)$
4. $10 + 2t - 5s - st$
5. $\frac{2}{3}bc - \frac{14}{3}b + c - 7$
6. $4u^2 + v + 2uv + 2u$
7. $ad + 3a - d^2 - 3d$
8. $n^2 + 2n + 3mn + 6m$
9. $2ax^2 + bx^2 - 2ay^2 - by^2$
10. $yz^2 - y^3 + z^3 - y^2z$
11. $y^3 - y^2 - 4y + 4$
12. $x^2a + x^2b - 16a - 16b$
13. $x^3 + x^2 - x - 1$
14. $a^3 - a^2 - 8a + 8$

Factoring Practice Key

I. Greatest Common Factor

1. 6
2. 5
3. 2
4. 8
5. 7
6. 9
7. 15
8. 24

II. Greatest Common Monomial Factor

1. $3(2x+1)$
2. $8x(3x-1)$
3. $6(x-2)$
4. $2x(x+4)$
5. $2(2x+5)$
6. $5x(2x+7)$
7. $5xy(2x-3y)$
8. $3(4x^2-3x+5)$
9. $3n(n^2-4n-10)$
10. prime
11. $x(2x^2-3x+5)$
12. $13m(1+2m-3m^2)$
13. $17(x^2+2x+3)$
14. $6m^2n^2(3n^2-2n+4)$

III. Factoring the Difference of Two Squares

1. $(x+1)(x-1)$
2. $(x+3)(x-3)$
3. prime
4. $(x+5)(x-5)$
5. $(3y+4)(3y-4)$
6. $(2x+5)(2x-5)$
7. $(3x+1)(3x-1)$
8. $(a+x)(a-x)$
9. $(5+m)(5-m)$
10. $(x+4y)(x-4y)$
11. $(5m+n)(5m-n)$
12. $(4+x)(4-x)$
13. $(6m+11)(6m-11)$
14. $2(x+2)(x-2)$
15. prime
16. $(2a+9b)(2a-9b)$
17. $3(2x+5)(2x-5)$
18. $b(a+b)(a-b)$
19. $-2(7+x)(7-x)$ *or* $2(x+7)(x-7)$
20. $5(x+3y)(x-3y)$
21. $(3x^2+2)(3x^2-2)$
22. $(4x^2+y)(4x^2-y)$

IV. Factoring Perfect Square Trinomials

1. $(x+4)^2$
2. $(x-8)^2$
3. $(y+6)^2$
4. $(a-5)^2$
5. $(4y+1)^2$
6. $(3x-1)^2$
7. $(5x+1)^2$
8. $(n-7)^2$
9. $(9x-5)^2$
10. $(2y-5)^2$
11. $(5a+6)^2$
12. $(4+5x)^2$
13. $(4x+3)^2$
14. $(7x-1)^2$
15. $(3y-5)^2$
16. prime
17. $(b+1)^2$
18. $(6x+7)^2$
19. $(x-9)^2$
20. $(3y-2)^2$

V. Special Factoring – Challenge

1. $(a+6)(a-6)$
2. $(3x+7)(3x-7)$
3. $(13m+2u)(13m-2u)$
4. $(xy+3z^2)(xy-3z^2)$
5. $\left(\frac{1}{2}x+5y\right)\left(\frac{1}{2}x-5y\right)$
6. $\left(\frac{1}{3}x+4\right)\left(\frac{1}{3}x-4\right)$
7. $(8+a^2b^2)(8-a^2b^2)$
8. $(y^3+10)(y^3-10)$
9. $\left(\frac{2}{3}xy+\frac{5}{6}z\right)\left(\frac{2}{3}xy-\frac{5}{6}z\right)$
10. $(y^4+9)(y^2+3)(y^2-3)$
11. $(1-4u)^2$ *or* $(4u-1)^2$
12. $(ab+3)^2$
13. $(x+y)^2$
14. $(2x+3y)^2$
15. $(10h+1)^2$
16. $(3a-4)^2$
17. $4a(a+1)^2$
18. $5c(2c+1)^2$
19. $[(x+4)+(y+1)][(x+4)-(y+1)]$ *or* $(x+y+5)(x-y+3)$
20. $[(x-1)-5]^2$ *or* $(x-6)^2$

VI. Factoring Trinomials: $x^2 + bx + c$

1. $(x+4)(x+2)$
2. $(c+2)(c+3)$
3. $(y-7)(y-2)$
4. $(x-8)(x-2)$
5. $(a+9)(a+3)$
6. $(x-12)(x-2)$
7. $(x-12)(x-3)$
8. $(y+18)(y+3)$
9. prime
10. $(x-5)(x-3)$
11. $(y-8)(y+4)$
12. $(x-3)(x+2)$
13. $(y+6)(y-3)$
14. $(b+9)(b-2)$
15. $(a+8)(a-7)$
16. $(c-6)(c+2)$
17. $(x-12)(x+3)$
18. $(y+7)(y-3)$
19. $(x-25)(x+3)$
20. $(x-8)(x+5)$

21. $(y+9)(y+5)$
22. $(x-9)(x-4)$

VII. ...More Factoring Trinomials: $x^2 + bx + c$

1. $(x+4)(x+3)$
2. $(m+3)(m+7)$
3. $(y-8)(y+1)$
4. $(x-1)(x-5)$
5. $(x+8)(x-4)$
6. $(x-5)(x+3)$
7. $(x-2)(x-4)$
8. $(y+3)(y+6)$
9. $(t-1)(t-3)$
10. $(v+2)(v+10)$
11. $(3-k)(17-k)$ *or* $(k-3)(k-17)$
12. $(a-2b)(a-12b)$
13. $(y-6)(y+12)$
14. $(x-15y)(x+4y)$
15. $(5r-s)(3r+s)$
16. $3(x-2y)(x+9y)$
17. $(x-6y)(x+y)$
18. $(x+6y)(x+2y)$
19. $(y-5x)(y-2x)$
20. $(a-15b)(a+4b)$

VIII. Factoring Trinomials: $ax^2 + bx + c$

1. $(2x+1)(x-3)$
2. $(3x-2)(x+4)$
3. $(2y+1)(y+7)$
4. $(7a-4)(a-1)$
5. $(5n+2)(n+3)$
6. $(2y+3)(2y+1)$
7. $(3x+7)(x-1)$
8. $(2x+3)(x+5)$
9. $(3y-2)(3y+4)$
10. $(3x+4)(2x-5)$
11. $(2n-7)(n+2)$
12. prime
13. $(2x+5)(5x-6)$
14. $(3y+1)(4y+1)$
15. $(2n-1)(n+5)$
16. $(2x+3)(x+2)$
17. $(5a+3)(a-9)$
18. $(3x-8)(5x+4)$
19. $(2a-1)(4a-3)$
20. $(2y+5)(y-4)$

IX. ...More Factoring Trinomials: $ax^2 + bx + c$

1. $(3x+1)(x+1)$
2. $(5z+2)(z+1)$
3. $(2n-1)(n-5)$
4. $(3z-2)(z+1)$
5. $(5h-7)(h+1)$
6. $(4s-3t)(2s-t)$
7. $(2x+3)(3x+5)$
8. $(7a-4b)(4a+3b)$
9. $(2a-3b)(a+5b)$
10. $(3x+2)(4x+3)$
11. prime
12. $(7y+8)(8y-7)$
13. $(4x-7y)(3x-2y)$
14. $(8x+7y)(8x-3y)$
15. $(4x+7y)^2$
16. $(6x-5)(3x-7)$

X. Factoring: Putting It All Together

1. $2(x+2)(x-2)$
2. $2(x+3)(x+1)$
3. $3(n+5)(n-2)$
4. $2(3x+2)(x-5)$
5. $2(x+10)(x-4)$
6. $5(t+1)(t+2)$
7. $2(2n+3)(2n-3)$
8. $7(2x+3)(x-1)$
9. $4(x+2)^2$
10. $2x(3+x)^2$ *or* $2x(x+3)^2$
11. $2x(1+y)(1-y)$
12. $3t(t+3)(t-3)$
13. $3(2a-1)(4a-3)$
14. $5(2x-1)(x+2)$
15. $3(x-7)^2$
16. $4x^2(x+1)(x-1)$

XI. ...More Factoring: Putting It All Together

1. $8(2x+1)(x-3)$
2. $3(3x-2)^2$
3. $5(x-14)(x+2)$
4. $6m(m^2+9m-1)$
5. $k^2(5k-2)(k+2)$
6. $x^2(y^2+x^2)(y+x)(y-x)$
7. $(y^2-8)(y^2+2)$
8. $(x^2+1)(x+2)(x-2)$
9. $[h+(a-3)][h-(a-3)]$ *or* $(h+a-3)(h-a+3)$
10. $(9x^2+4y^2)(3x+2y)(3x-2y)$
11. $mn^2(2-m)^2$ *or* $mn^2(m-2)^2$
12. $[(2a+3)+(a-1)][(2a+3)-(a-1)]$ *or* $(3a+2)(a+4)$
13. $(2d^2+1)^2(2d^2-1)^2$
14. $(x+2)^3(x-2)$

XII. Extra: Factoring by Grouping

1. $(x+2)(x+y)$
2. $(a-2)(3a+b)$
3. $(t-1)(t^2+2)$
4. $(5+t)(2-s)$
5. $(c+7)\left(\frac{2}{3}b+1\right)$
6. $(2u+1)(2u+v)$
7. $(d+3)(a-d)$
8. $(n+2)(n+3m)$
9. $(x-y)(x+y)(2a+b)$
10. $(z-y)(z+y)^2$
11. $(y-1)(y+2)(y-2)$
12. $(a+b)(x+4)(x-4)$
13. $(x+1)^2(x-1)$
14. $(a-1)(a^2-8)$