p. 176-183 # 3bd, 4bd, 5bd, 6bd, 7b, 8, 9, 10bd, 13, 18bd, 20

Chapter 3.1 Factoring Polynomial Equations

Pre-Calculus 11 Name__________ ____________

Notes

Last year we spent a significant amount of time factoring. This section will review some of the factoring strategies we learned.

Example 1: Is d-4 a factor of each trinomial? Justify the answer.

FOIL

$ad^2+bd-56$

a. $2d^2+6d-56$

if $d-4$ is a factor then: $(d-4)(ad+b)=2d^2+6d-56$

$ad^2+bd-4ad-4b$

$=ad^2+d(b-4a)-4b=2d^2+6d-56$

$a=2$

$=2d^2+d(b-8)-4b=2d^2+6d-56$

$-4b=-56$

$b=14$

$=2d^2+6d-56=2d^2+6d-56$ ✓

yes $d-4$ is a factor.

b. $2d^2+13d+4$ YOU TRY

$(d-4)(ad+b)=2d^2+13d+4$

$ad^2+d(b-4a)-4b=2d^2+13d+4$

$a=2$

$2d^2+d(b-8)-4b=2d^2+13d+4$

$-1-8$

$-4b=4$

$b=-1$

$2d^2+(-9d)+4\neq 2d^2+13d+4$

so no $d-4$ is not a factor.

Chapter 3.1 Factoring Polynomial Equations

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Example 2 Factor each trinomial with rational coefficients.

a. $x^2 - 1.5x + 0.5$ $\left(\frac{1}{10}\right)$

$\hookrightarrow$ factor out a 0.1 to give integer coefficients.

$\frac{1}{10}$

$0.1(\underbrace{10x^2 - 15x + 5}_{\text{factor this.}})$ (basically take out 0.1 and multiply by 10)

$ac = 10 \times 5 = 50$ $\begin{pmatrix} -10 \\ -5 \end{pmatrix}$

$= 0.1(10x^2 - 10x - 5x + 5)$

$= 0.1(10x(x-1) - 5(x-1))$

$= 0.1[(10x-5)(x-1)]$

factor out a 5

$= 0.5[(2x-1)(x-1)]$

b. $x^2 - \frac{17}{3}x - 2$ YOU TRY factor out $\frac{1}{3}$

$\frac{1}{3}(3x^2 - 17x - 6)$

$ac = -18$
$+1$

$\frac{1}{3}(3x^2 - 18x + x - 6)$

$\frac{1}{3}[(3x(x-6) + (x-6)]$

$\frac{1}{3}[(3x+1)(x-6)]$

Chapter 3.1 Factoring Polynomial Equations

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Notes

Some polynomial expressions contains functions of a variable, for instance

$x^2 - x - 16$

$(x+3)^2 - 6(x+3) - 16$ contains $f(x) = x + 3$. Therefore we will use substitution to help us factor

Example 3 Factor each polynomial expression.

a. $x^2 + 5x - 24$

2 #s x −24 −3, +8

\+ 5

$(x-3)(x+8)$

b. $2(x-6)^2 + 10(x-6) - 48$

use substitution to put into $ax^2 + bx + c$

let $a = x - 6$

$2a^2 + 10a - 48$ −96 2 factors 16, −6

$\underbrace{2a^2 + 16a} \underbrace{- 6a - 48}$

$2a(a+8) - 6(a+8)$

$(a+8)(2a-6)$ Now put ~~x~~ −6 back in!

~~X~~ factor fully!

$2(a+8)(a-3)$

$2(x-6+8)(x-6-3) = 2(x+2)(x-9)$

c. $3(2x+5)^2 + 10(2x+5) - 8$

Chapter 3.1 Factoring Polynomial Equations

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Example 4 Factor each polynomial expression using the Difference of Squares Pattern.

a. $a^2 - b^2$ ← last year

$(a-b)(a+b)$

b. $(\overset{a}{3x+4})^2 - (\overset{b}{2y-1})^2$

$(a+b)(a-b)$

$= [\underbrace{(\overset{a}{3x+4}) + (\overset{b}{2y-1})}_{\text{simplify}}][(3x+4) - (2y-1)]$

4+1

$= (3x+2y+3)(3x-2y+5)$

STOP here.

c. $27(2x-3)^2 - 75(y-4)^2$

$3[9(2x-3)^2 - 25(y-4)^2]$

$9 \to 3^2 \qquad 25 \to 5^2$

$(a+b)(a-b)$

$3[\underbrace{3^2(2x-3)^2}_{a} - \underbrace{5^2(y-4)^2}_{b}]$

$3[3(2x-3)+5(y-4)][3(2x-3)-5(y-4)]$

$3[6x-9+5y-20][6x-9-5y+20]$

$3[6x+5y-29][6x-5y+11]$

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* see 3.1 for more examples.