FMP10 Name: _____
Date: _____

Unit 3A: Polynomials

3A.1 Like Terms & Distribution

Recall from Math 9

Term:

Monomial:

Binomial:

Trinomial:

Degree:

Like Terms:

Ex. Simplify. State type and degree of each polynomial answer.

a) $2x + 3 - y - 5 + 3x - 2y$

b) $x^2 + 4x - 3 - x + 2x^2$

c) $-3x^2 + 2xy^2 + x^2 - 1 - 4x^2y + 5xy^2 + 3$

Distribution:

Ex. Simplify. State type and degree of each polynomial answer.

a) $3(5x + 2)$

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

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

d) $-3x^2y + 4y(2 - x^2) - 2y$

e) $(2x - 5z + y) - (7x + 4y - 2z)$

f) $4x(2x + 1) - (3x + 1) + (x^2 - 2)$

FMP10 Name: _____
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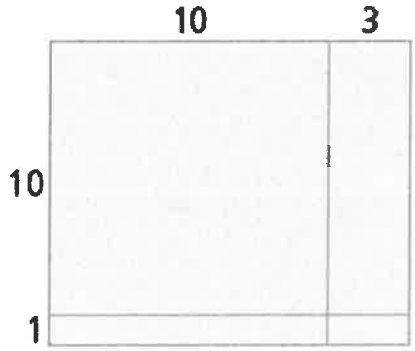
3A.2 Polynomial Multiplication

Exploring Polynomial Multiplication

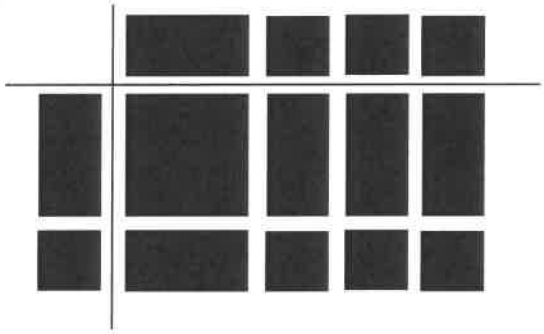
Multiply: $13 \times 11 =$

Use the area model below to multiply 13×11:



Use algebra tiles to determine the product:

$(x + 3)(x + 1)$



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

$(2x + 4)(3x - 1)$

Complete pg. 209/#

Can also use the distributive property to multiply polynomials:

Ex. Simplify:

$(x-2)(2x+1)$ $(x-3)(x-5)$

$(5m-1)(2m-6)$ $(b-4)^2$

Can be extended to multiplication of larger polynomials:

Ex. Simplify:

$(x+2)(2x^2-5x+1)$ $(q^2+q-2)(2q^2-3q+1)$

Practice: pg. 209/ #

FMP10 Name: _____

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3A.3 Polynomial Division

Polynomial ÷ Monomial (recall from Math 9)

Ex.

$\frac{4x+2}{2}$ * turn into a series of monomial/monomial divisions

$= \frac{4x}{2} + \frac{2}{2}$

$=$

Ex. $\frac{6x^3-12x^2}{3x}$

Ex. $\frac{15x^3y^2-10xy^4+25x^4y^3}{-5xy^2}$

Polynomial ÷ Binomial (Long Division)

Recall from grade ???

Ex. Solve by long division: $612 \div 5$

*note: $\frac{dividend}{divisor} = quotient + \frac{remainder}{divisor}$

Similar for polynomial division:

Ex. Solve:

$6x^2 + 7x + 9 \div 2x + 1$

$-3x + 5 + x^2 \div x - 2$

$8x^2 + 11 - 6x \div 2x - 3$

$9m^2 - 5 \div 3m + 2$

Practice: Worksheet (B-25/C-13)/ work on separate sheet

Why Did King Kong Eat a Truck?

Circle the appropriate number-letter pairs in each column. Write the letter in the matching numbered box at the bottom of the page. (Hint: You should circle 11 number-letter pairs in each column.)

Circle the number-letter of each TRUE STATEMENT:

8-S	$(x+2)^2 = x^2 + 4x + 4$
13-E	$(a-5)^2 = a^2 - 10a + 25$
10-A	$(u+8)^2 = u^2 + 16u + 64$
2-H	$(m-4)^2 = m^2 - 16m + 16$
18-G	$(3x+1)^2 = 9x^2 + 6x + 1$
14-D	$(5t-2)^2 = 25t^2 - 20t + 4$
4-P	$(2b+3)^2 = 4b^2 + 12b + 6$
20-A	$(2n+7)^2 = 4n^2 + 28n + 49$
2-E	$(10d-4)^2 = 100d^2 - 80d + 16$
5-K	$(8x-1)^2 = 16x^2 - 16x + 1$
7-R	$(4w+5)^2 = 16w^2 + 20w + 25$
4-L	$(x^2-3)^2 = x^4 - 6x^2 + 9$
11-T	$(k^2+9)^2 = k^4 - 18k^2 + 81$
5-W	$(2a+b)^2 = 4a^2 + 4ab + b^2$
15-A	$(3u-2v)^2 = 9u^2 - 12uv + 4v^2$
6-E	$(8a+b)^2 = 64a^2 + 8ab + b^2$
1-H	$(c^2-6d^2)^2 = c^4 - 12c^2d^2 + 36d^4$
21-I	$(2xy-5)^2 = 4x^2y^2 - 20xy + 10$

Circle the number-letter of each TRINOMIAL SQUARE:

6-A	$n^2 + 6n + 9$
11-N	$x^2 - 14x + 49$
3-R	$a^2 + 2a + 4$
7-Y	$c^2 + 2c + 1$
12-B	$k^2 - 5k + 25$
21-C	$x^2 - 12x + 36$
3-A	$4t^2 + 12t + 9$
12-T	$81x^2 - 18x + 1$
17-L	$4m^2 + 8m + 16$
16-B	$9w^2 - 24w + 16$
9-F	$25t^2 - 45t + 9$
22-D	$4x^4 + 8x^2 + 1$
9-W	$a^2 + 2ab + b^2$
22-K	$4m^2 + 20mn + 25n^2$
19-L	$9a^2 - 27ab + 9b^2$
17-I	$100u^2 - 60uv + 9v^2$
8-E	$100a^2 + 20ab + 4b^2$
19-M	$9x^4 + 6x^2y^2 + y^4$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

3.3A

Practice sets + work separate sheet

What Did the Carpenters Call Their Bass Quartet?

Simplify each expression. Assume that no divisor equals zero. Find your answer in the set of answers under the exercise and cross out the box above it. When you finish, the answer to the title question will remain.

(1) $\dfrac{6x+9}{3}$

(2) $\dfrac{18x^2-50}{2}$

(3) $\dfrac{12x^2+20x}{4x}$

(4) $\dfrac{20x^3+5x^2}{5x}$

(5) $\dfrac{2x^3-7x^2}{x^2}$

(6) $\dfrac{12v^5-27v^4}{3v^2}$

(7) $\dfrac{30u^4-6u}{-6u}$

(8) $\dfrac{u^2v+uv^2}{uv}$

(9) $\dfrac{8uv^4-14u^2v^3}{2uv}$

(10) $\dfrac{-10u^3v^2+5u^2v^5}{-5u^2v}$

(11) $\dfrac{8a^3+4a^2-24a}{4a}$

(12) $\dfrac{21ab^3+14a^2b+35a^4}{7a}$

(13) $\dfrac{2a^3b-6a^2b^2+16ab^3}{-2ab}$

(14) $\dfrac{45a^2b^4-60a^3b^2-15a^2b}{15a^2b}$

(15) $\dfrac{15a^5b^4+3a^4b^5-6a^3b^6}{3a^2b^3}$

A	4	T	O	S	H	2	N	E	B	8	T	A	L	U	R	O	B	E	A	S	4	N
$2x-7$	$3x+5$	$4x^2+5$	$2x+3$	$4x^2+x$	$3x-25$	$9x^2-25$	$4v^3-7uv^2$	$2uv-5v$	$4v^3-9v^2$	$u+v$	$4v^3+2v$	$2uv-v^4$	$-5u^3+1$	$2a^2-a-1$	$3b^3-4ab-1$	$3b^3+2ab+5a^3$	$-a^2-4ab+1$	$2a^2+a-6$	$3b^3-3ab-8b^2$	$5a^3b+a^2b^2-2ab^3$	$5a^3b+a^2b^3-4ab^2$	$-a^2+3ab-8b^2$

3.4A

How Did the Hunter Get Hurt While Bending Over to Study Some Tracks?

Divide and write your answer as a polynomial or mixed expression. Cross out the box containing your answer. When you finish, write the letters from the remaining boxes in the spaces at the bottom of the page.

1. $\frac{x^2+8x+15}{x+5}$
2. $\frac{2x^2+3x-14}{x-2}$
3. $\frac{x^2-5x+8}{x-3}$
4. $\frac{x^2-x+12}{x-6}$
5. $\frac{3x^2-5x-11}{x+1}$
6. $\frac{x^2+1+8x}{x+4}$
7. $\frac{x^2+4}{x-3}$
8. $\frac{2x^2-3x-1}{2x+1}$
9. $\frac{6x^2-7x+5}{3x-5}$

TH $x-2+\frac{2}{x-3}$	HE $x+3+\frac{13}{x-3}$	AT $2x+2+\frac{6}{3x-5}$	ST $x+5+\frac{42}{x-6}$	SH $2x+1+\frac{10}{3x-5}$
RA $x-3+\frac{3}{2x+1}$	SK $x+3$	OT $x-2+\frac{1}{2x+1}$	IN $3x-6-\frac{5}{x+1}$	HI $x+4+\frac{9}{x-3}$
BE $3x-8-\frac{3}{x+1}$	TH $x+2-\frac{11}{x+4}$	HU $2x+7$	NT $x+4-\frac{15}{x+4}$	IM $x+7+\frac{33}{x-6}$

FMP10 Unit 5A Review (1) Worksheets/ Student Choice (on sheet) (2) pg. 252/1, 2ef, 3-5

(3) pg. 254/1, 2, 6c-f, 7, 11

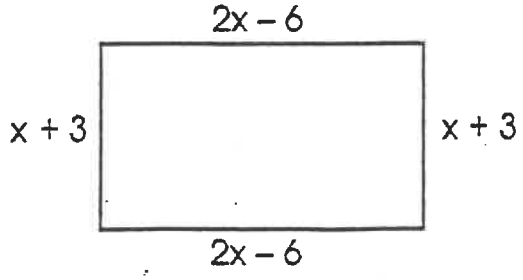
Adding and Subtracting Polynomials

$(x^3 + 2x^2 - 8x) - (-2x^2 + 7x - 5) = x^3 + 2x^2 - 8x + 2x^2 - 7x + 5 = x^3 + 4x^2 - 15x + 5$

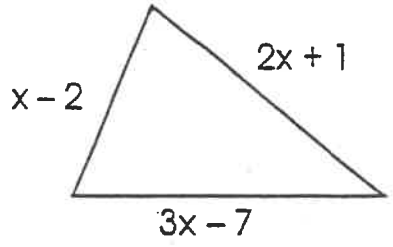
1. $(4x + 2) + (x - 1)$
2. $(5a - 2b + 4) + (2a + b + 2)$
3. $(3a + 2b) - (a - b)$
4. $(x^2 + y^2 - ab) - (x^2 - y^2 + ab)$
5. $(4a^2 - 5ab - 6b^2) + (10ab - 6a^2 - 8b^2)$
6. $(4x^2 - 2x - 3) - (-5x - 4)$
7. $(4a^2 - 4ab - b^2) + (a^2 - b^2) + (2ab + a^2 + b^2)$
8. $(-4x^3 - 6x^2 + 3x - 1) - (8x^3 + 4x^2 - 2x + 3)$
9. $(a + 2b) + (3b - 4c) + (5a - 7c) + 3b$
10. $(x^2 - 2xy + y^2) - (x^2 - 2xy + y^2)$
11. $(x + 3y) + (-3x - y) - (x - y)$
12. $(2x^2 + 3y^2 - z^2) - (x^2 - y^2 - z^2) + (4x^2 - 3y^2)$
13. $(2x + 3) + (-2x^2 + x - 5)$
14. $(2y + 3x - 4) + (9 - 8y - 5x) + (3x + 4y - 2)$
15. $(-2y^2 + 8) - (3y^2 - 4y - 6)$
16. $(7y + 4x + 9) - (6x - 8y + 11)$

Find the perimeter.

17.



18.



Review

Multiplying a Polynomial by a Monomial

$-2a^2(9 - a - 4a^2) = -2a^2 \cdot 9 - (-2a^2 \cdot a) - (-2a^2 \cdot 4a^2) = -18a^2 + 2a^3 + 8a^4$

$(x + 2)(2x^2) = 2x^2 \cdot x + 2x^2 \cdot 2 = 2x^3 + 4x^2$

1. $2(x^2 - xy + 3y^2)$
2. $-2n(4 + 5n^3)$
3. $c^2d(c^2d^3 + 2cd^2 + d)$
4. $2xy^2(2 - x - x^2y)$
5. $(a^2 - 3ab - 2b^2)(-2ab)$
6. $3n(8n^2 - 2n)$
7. $(w^2z - 2wz + z)(-z^2)$
8. $-3ab^2(a^3b^2 - 2a^2b)$
9. $4x^2y(9x^2 - 6xy^2 - 7)$
10. $-6k^2m^2(2k - 3m + 4km - k^2m^2)$
11. $-n^2(n + 4n^2)$
12. $(4x^2 - 7x)(-x)$
13. $2x^2(x^3 - 2x^2 + 8x - 5)$
14. $(-6x^3)(3x^2 - 1)$
15. $(6x - 5x^2 + 8)(-3x)$
16. $-5x^2(2x^3 + 3x^2 - 7x + 9)$

Find the area.

$A = l \cdot w$

17.

18. A triangle has a base length (b) of $2x + 4$ and a height (h) of $3y$.

(Area = $\frac{1}{2}bh$)

Algebraic Fractions

Dividing a Polynomial by a Monomial

$$\frac{r^2 + 6r + 5}{r} = \frac{r^2}{r} + \frac{6r}{r} + \frac{5}{r}$$

$$= r + 6 + \frac{5}{r}$$

1. $\frac{a^2 + 2a}{a}$

2. $\frac{14x + 35}{7}$

3. $\frac{4y^2 + 6y}{2y}$

4. $\frac{x^2y - xy^2}{xy}$

5. $\frac{25u^2 - 15u - 5}{-5}$

6. $\frac{12x^2 - 9x^3 + 6x^4}{3x}$

7. $\frac{m^2n^2 + m - n}{mn}$

8. $\frac{45a^2b^4 - 60a^3b^2 - 15a^2b}{-15a^2b}$

9. $\frac{14k^9m^3 - 4k^2m^2 + 12km^3}{2km^2}$

10. $\frac{12v^5 - 27v^4 + 18uv^3}{3uv^3}$

11. $\frac{2x^2 - 10xy}{2x}$

12. $\frac{3x^3y^2 - 6x^2y^2 + 6xy^2}{3xy}$

13. $\frac{6z^2 - 3z + 9}{3z}$

14. $\frac{6a^2 + 42a + 72}{6a^3}$

15. $\frac{64x^4 - 64x^3}{64x^3}$

16. $\frac{18m^3n^4 - 12m^2n^3 + 24n^2}{6m^2n}$

Review

Dividing Polynomials

$$\frac{6a2 + 4a + 3}{3a - 1} \Rightarrow 3a - 1 \overline{)\,6a^2 + 4a + 3}$$

$$2a + 2 + \frac{5}{3a - 1}$$

$$\begin{array}{r} 6a^2 - 2a \\ \hline 6a + 3 \\ 6a - 2 \\ \hline 5 \end{array}$$

1. $\dfrac{s^2 + 3s - 4}{4 + s}$
(Hint: Rewrite denominator as s + 4)

2. $\dfrac{a^2 + 2a + 3}{a + 3}$

3. $\dfrac{x^2 + 4}{x + 2}$
(Hint: Write dividend as $x^2 + 0x + 4$)

4. $\dfrac{3c^2 + 8c + 4}{3c + 2}$

5. $\dfrac{6r^2 + r - 5}{2r - 3}$

6. $\dfrac{9t^2 + 1}{3t + 2}$

7. $\dfrac{2u^2 - 3uv - 9v^2}{u - 3v}$

8. $\dfrac{z^3 + z^2 - 3z + 9}{z + 3}$

9. $\dfrac{6x^3 + 5x^2 + 9}{2x + 3}$

10. $\dfrac{2y^3 + 5y^2 + 7y + 6}{y^2 + y + 2}$

11. $x^3 - x^2 - 2x + 10 \div x + 2$

12. $8x + 13x^2 + 6x^3 + 5 \div 3x + 5$

13. $y^3 - 2y^2 + 3 \div y + 1$

14. $\dfrac{-32x + 2x^3 + 42}{2x - 6}$

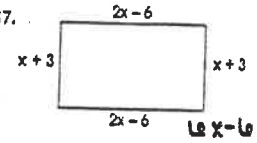
KEYS

Polynomials

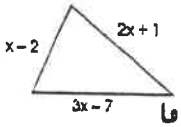
Adding and Subtracting Polynomials

1. $(4x + 2) + (x - 1)$ $5x+1$
2. $(5a - 2b + 4) + (2a + b + 2)$ $7a-b+6$
3. $(3a + 2b) - (a - b)$ $2a+3b$
4. $(x^2 + y^2 - ab) - (x^2 - y^2 + ab)$ $2y^2-2ab$
5. $(4a^2 - 5ab - 6b^2) + (10ab - 6a^2 - 8b^2)$ $-2a^2+5ab-14b^2$
6. $(4x^2 - 2x - 3) - (-5x - 4)$ $4x^2+3x+1$
7. $(4a^2 - 4ab - b^2) + (a^2 - b^2) + (2ab + a^2 + b^2)$ $6a^2-2ab-b^2$
8. $(-4x^3 - 6x^2 + 3x - 1) - (8x^3 + 4x^2 - 2x + 3)$ $-12x^3-10x^2+5x-4$
9. $(a + 2b) + (3b - 4c) + (5a - 7c) + 3b$ $6a+8b-11c$
10. $(x^2 - 2xy + y^2) - (x^2 - 2xy + y^2)$ 0
11. $(x + 3y) + (-3x - y) - (x - y)$ $-3x+3y$
12. $(2x^2 + 3y^2 - z^2) - (x^2 - y^2 - z^2) + (4x^2 - 3y^2)$ $5x^2+y^2$
13. $(2x + 3) + (-2x^2 + x - 5)$ $-2x^2+3x-2$
14. $(2y + 3x - 4) + (9 - 8y - 5x) + (3x + 4y - 2)$ $x-2y+3$
15. $(-2y^2 + 8) - (3y^2 - 4y - 6)$ $-5y^2+4y+14$
16. $(7y + 4x + 9) - (6x - 8y + 11)$ $-2x+15y-2$

Find the perimeter.

17. 

$6x-6$

18. 

$6x-8$

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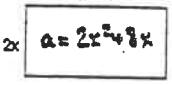
Polynomials

Multiplying a Polynomial by a Monomial

1. $2(x^2 - xy + 3y^2)$ $2x^2-2xy+6y^2$
2. $-2n(4 + 5n^2)$ $-8n-10n^3$
3. $c^2d(c^2d^2 + 2cd^2 + d)$ $c^4d^4+2c^3d^3+c^2d^2$
4. $2xy^2(2 - x - x^2y)$ $4xy^2-2x^2y^3-2x^3y^3$
5. $(a^2 - 3ab - 2b^2)(-2ab)$ $-2a^3b+6a^2b^2+4ab^3$
6. $3n(8n^2 - 2n)$ $24n^3-6n^2$
7. $(w^2z - 2wz + z)(-z^2)$ $-w^2z^3+2wz^3-z^3$
8. $-3ab^2(a^2b^2 - 2a^2b)$ $-3a^3b^4+6a^3b^3$
9. $4x^2y(9x^2 - 6xy^2 - 7)$ $36x^4y-24x^3y^3-28x^2y$
10. $-6k^2m^2(2k - 3m + 4km - k^2m^2)$ $-12k^3m^2+18k^2m^3-24k^3m^3+6k^4m^4$
11. $-n^2(n + 4n^2)$ $-4n^4-n^3$
12. $(4x^2 - 7x)(-x)$ $-4x^3+7x^2$
13. $2x^2(x^3 - 2x^2 + 8x - 5)$ $2x^5-4x^4+16x^3-10x^2$
14. $(-6x^3)(3x^2 - 1)$ $-18x^5+6x^3$
15. $(6x - 5x^2 + 8)(-3x)$ $15x^3-18x^2-24x$
16. $-5x^2(2x^4 + 3x^2 - 7x + 9)$ $-10x^6-15x^4+35x^3-45x^2$

Find the area.

17. $A = l \cdot w$



18. A triangle has a base length (b) of 2x + 4 and a height (h) of 3y.

(Area = $\frac{1}{2}bh$) $3xy+6y$

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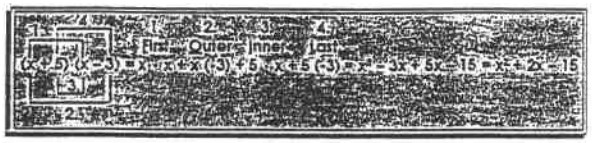
Polynomials

Multiplying Binomials Using FOIL



1. $(x + 2)(x + 3)$ x^2+5x+6
2. $(y + 7)(y + 4)$ $y^2+11y+28$
3. $(x - 8)(x + 4)$ $x^2-4x-32$
4. $(x - 8)(x - 4)$ $x^2-12x+32$
5. $(y - 4)(y + 5)$ y^2+y-20
6. $(x - 9)(x - 2)$ $x^2-11x+18$
7. $(2x + 4)(x + 3)$ $2x^2+10x+12$
8. $(3x + 2)(2x + 5)$ $6x^2+19x+10$
9. $(4x - 9)(3x + 1)$ $12x^2-23x-9$
10. $(2x + 5)(4x - 3)$ $8x^2+14x-15$
11. $(n - 7)(3n - 2)$ $3n^2-23n+14$
12. $(5x + 2)(3x - 7)$ $15x^2-29x-14$
13. $(-4x + 5)(-2x - 3)$ $8x^2+2x-15$
14. $(-x - 4)(4 + 3x)$ $-3x^2-16x-16$
15. $(x + 2y)(2x + 3y)$ $2x^2+7xy+6y^2$
16. $(6x - y)(3x - 2y)$ $18x^2-15xy+2y^2$
17. $(4x + y)(3x - 4y)$ $12x^2-13xy-4y^2$
18. $(5a + 3b)(4a - b)$ $20a^2+7ab-3b^2$

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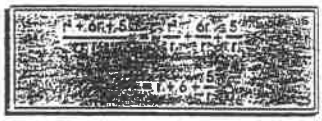
Algebraic Fractions

Dividing a Polynomial by a Monomial



1. $\frac{a^2 + 2a}{a}$ $a+2$
2. $\frac{14x + 35}{7}$ $2x+5$
3. $\frac{4y^2 + 6y}{2y}$ $2y+3$
4. $\frac{x^2y - xy^2}{xy}$ $x-y$
5. $\frac{25u^2 - 15u - 5}{-5}$ $-5u^2+3u+1$
6. $\frac{12x^2 - 9x^3 + 6x^4}{3x}$ $4x-3x^2+2x^3$
7. $\frac{m^2n^2 + m - n}{mn}$ $mn+\frac{1}{n}-\frac{1}{m}$
8. $\frac{45a^2b^4 - 60a^3b^2 - 15a^2b}{-15a^2b}$ $-3b^3+4ab+1$
9. $\frac{14k^3m^3 - 4k^2m^2 + 12km^3}{2km^2}$ $7k^2m-2k+6m$
10. $\frac{12v^4 - 27v^4 + 18uv^3}{3uv^3}$ $4\frac{v^2}{u}-\frac{9v}{u}+6$
11. $\frac{2x^2 - 10xy}{2x}$ $x-5y$
12. $\frac{3x^3y^2 - 6x^2y^2 + 6xy^2}{3xy}$ $x^2y-2xy+2y$
13. $\frac{6z^2 - 3z + 9}{3z}$ $2z-1+\frac{3}{z}$
14. $\frac{6a^2 + 42a + 72}{6a^2}$ $\frac{1}{a}+\frac{7}{a^2}+\frac{12}{a^2}$
15. $\frac{64x^4 - 64x^3}{64x^3}$ $x-1$
16. $\frac{18m^3n^4 - 12m^2n^3 + 24n^2}{6m^2n}$ $3mn^3-2n^2+\frac{4n}{m^2}$

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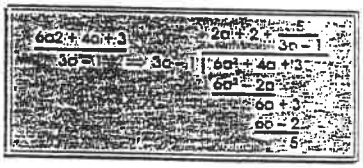
Review

Algebraic Fractions

Dividing Polynomials



1. $\frac{s^2 + 3s - 4}{4 + s}$ $s-1$
(Hint: Rewrite denominator as $s + 4$)

2. $\frac{a^2 + 2a + 3}{a + 3}$ $a-1+\frac{6}{a+3}$

3. $\frac{x^2 + 4}{x + 2}$ $x-2+\frac{8}{x+2}$
(Hint: Write dividend as $x^2 + 0x + 4$)

4. $\frac{3a^2 + 8a + 4}{3a + 2}$ $a+2$

5. $\frac{6r^2 + r - 5}{2r - 3}$ $3r+5+\frac{10}{2r-3}$

6. $\frac{9t^2 + 1}{3t + 2}$ $3t-2+\frac{5}{3t+2}$

7. $\frac{2u^2 - 3uv - 9v^2}{u - 3v}$ $2u+3v$

8. $\frac{z^3 + z^2 - 3z + 9}{z + 3}$
z^2-2z+3

9. $\frac{6x^3 + 5x^2 + 9}{2x + 3}$
$3x^2-2x+3$

10. $\frac{2y^3 + 5y^2 + 7y + 6}{y^2 + y + 2}$
$2y+3$

11. $x^3 - x^2 - 2x + 10 \div x + 2$
$x^2-3x+4+\frac{2}{x+2}$

12. $8x + 13x^2 + 6x^3 + 5 \div 3x + 5$
$2x^2+x+1$

13. $y^3 - 2y^2 + 3 \div y + 1$
y^2-3y+3

14. $\frac{-32x + 2x^3 + 42}{2x - 6}$ x^2+3x-7