Factor the expression completely.

1. $13t + 39y$ — $13(t+3y)$

2. $3k^2 - 3k$ — $3k(k-1)$

exponent

3. $5a^3b2 - a^2b + 11ab^2$ — $ab(5ab^2 - ab + 11b^2)$

4. $x^2 - 25$ — $(x+5)(x-5)$

5. $n^2 - 13n + 22$ — $(n-2)(n-11)$

6. $3x^2 + 30x + 63$ — $3(x^2+10x+21)$ $3(x+7)(x+3)$

Warm Up

factoring review

- always begin by finding a GCF
- ac method

Write a function *g* whose graph represents the indicated transformations of the graph of *f*.

1. $f(x) = x$; vertical stretch by a factor of 3, followed by a translation 2 units down

2. $f(x) = x$; vertical shrink by a factor of $\frac{1}{4}$, followed by a translation 1 unit up

3. $f(x) = |x|$; horizontal stretch by a factor of 3, followed by a translation 1 unit left

Cumulative Warm Up

(skip w/ TAC)

Essential Question

How can you use the factors of a cubic polynomial to solve a division problem involving the polynomial?

Essential Question

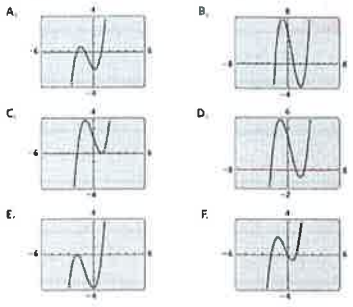
- long division
- synthetic division

Work with a partner. Match each division statement with the graph of the related cubic polynomial $f(x)$. Explain your reasoning. Use a graphing calculator to verify your answers.

a. $\frac{f(x)}{x} = (x-1)(x+2)$ b. $\frac{f(x)}{x-1} = (x-1)(x+2)$

c. $\frac{f(x)}{x+1} = (x-1)(x+2)$ d. $\frac{f(x)}{x-2} = (x-1)(x+2)$

e. $\frac{f(x)}{x+2} = (x-1)(x+2)$ f. $\frac{f(x)}{x-3} = (x-1)(x+2)$



Exploration 1

- Use graphing software to match graphs and equations

Work with a partner. Use the results of Exploration 1 to find each quotient. Write your answers in standard form. Check your answers by multiplying.

a. $(x^3 + x^2 - 2x) \div x$ **b.** $(x^3 - 3x + 2) \div (x - 1)$

c. $(x^3 + 2x^2 - x - 2) \div (x + 1)$ **d.** $(x^3 - x^2 - 4x + 4) \div (x - 2)$

e. $(x^3 + 3x^2 - 4) \div (x + 2)$ **f.** $(x^3 - 2x^2 - 5x + 6) \div (x - 3)$

Exploration 2

- Can use to demonstrate division

Divide $2x^4 + 3x^3 + 5x - 1$ by $x^2 + 3x + 2$.

Example 1

- do long division
- demonstrate how to write remainders

Divide using polynomial long division.

1. $(x^3 - x^2 - 2x + 8) \div (x - 1)$

2. $(x^4 + 2x^2 - x + 5) \div (x^2 - x + 1)$

Monitoring Progress 1-2

· additional long division practice

Divide $-x^3 + 4x^2 + 9$ by $x - 3$.

Example 2

· long division

Divide $3x^3 - 2x^2 + 2x - 5$ by $x + 1$.

Example 3

· long division

Divide using synthetic division.

3. $(x^3 - 3x^2 - 7x + 6) \div (x - 2)$

4. $(2x^3 - x - 7) \div (x + 3)$

Monitoring Progress 3-4

begin synthetic division

Core Concept

The Remainder Theorem

If a polynomial $f(x)$ is divided by $x - k$, then the remainder is $r = f(k)$.

Core Concept

Use synthetic division to evaluate $f(x) = 5x^3 - x^2 + 13x + 29$ when $x = -4$.

Example 4

Use synthetic division to evaluate the function for the indicated value of x.

5. $f(x) = 4x^2 - 10x - 21; x = 5$

6. $f(x) = 5x^4 + 2x^3 - 20x - 6; x = 2$

Monitoring Progress 5-6

Muddiest Point: Ask students to identify, aloud or on a paper to be collected, the muddiest point(s) about the lesson. What was difficult to understand?

Closure