Notes 4.6 Remainder and Factor Theorem:
I can find the value of a function using synthetic division.
I can figure out if something is a factor of a polynomial using synthetic division.
I can find factors of a polynomial when given a polynomial and one of its factors.

I can find the value of a function using synthetic division.

Remainder Theorem:

If the polynomial $P(x)$ is divided by $(x-c)$ then the remainder is the value of $P(c)$

Use synthetic division and the Remainder Theorem to evaluate $f(c)$

1. $f(x) = 2x^2 - 4x + 3;\ f(3)$

3] 2 -4 3
6 6
2 2 | 9

$f(3) = 9$

2. $f(x) = 2x^3 - x^2 + 4x - 1;\ f(-2)$ (you try)

$f(-2) = 2(-2)^3 - (-2)^2 + 4(-2) - 1 = -29$

-2] 2 -1 4 -1
-4 10 -28
2 -5 14 | -29

You try ☺

3. $f(x) = -5x^3 + 7x - 11;\ f(4)$

4] -5 0 7 -11
-20 -80 -292
-5 -20 -73 | -303

4. $f(x) = 2x^5 + x^4 - 9x + 21;\ f(5)$

5] 2 1 0 0 -9 21
10 55 275 1375 6830
2 11 55 275 1366 | 6851

I can figure out if something is a factor of a polynomial using synthetic division.

Factor Theorem:

c is a zero of P if and only if $(x-c)$ is a factor of $P(x)$

Use the Factor Theorem to show that $x - c$ is a factor of $P(x)$ for the given value of c.

6. $P(x) = x^3 + 2x^2 - 3x - 10,\quad c = 2$

2] 1 2 -3 -10
2 8 10
1 4 5 | 0

yes

7. $P(x) = x^4 + 3x^3 - 16x^2 - 27x + 63,\quad c = -3$

-3] 1 3 -16 -27 63
-3 0 48 -63
1 0 -16 21 | 0

yes

You try ☺

8. $P(x) = x^3 - 3x^2 + 3x - 1,\quad c = 1$

1] 1 -3 3 -1
1 -2 1
1 -2 1 | 0

yes

I can find factors of a polynomial when given a polynomial and one of its factors.

Given a polynomial and one of its factors, find the remaining factors of the polynomial.

9. $x^3 - 3x + 2;\ x + 2$

$x^2 - 2x + 1$

$(x-1)^2$

-2 | $1 \quad 0 \quad -3 \quad 2$

$\quad\quad -2 \quad 4 \quad -2$

$1 \quad -2 \quad 1 \quad 0$

10. $x^3 - 7x + 6;\ x + 3$

$x^2 - 3x + 2$

$(x-2)(x-1)$

-3 | $1 \quad 0 \quad -7 \quad 6$

$\quad\quad -3 \quad 9 \quad -6$

$1 \quad -3 \quad 2 \quad 0$

11. $x^3 - 3x^2 - 13x + 15;\ x - 5$

5 | $1 \quad -3 \quad -13 \quad 15$

$\quad\quad 5 \quad 10 \quad -15$

$1 \quad 2 \quad -3 \quad 0$

$x^2 + 2x - 3$

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

12. $x^4 + 2x^3 - 4x^2 - 2x + 3;\ x - 1$

1 | $1 \quad 2 \quad -4 \quad -2 \quad 3$

$\quad\quad 1 \quad 3 \quad -1 \quad -3$

$1 \quad 3 \quad -1 \quad -3 \quad 0$

-1 | $1 \quad 3 \quad -1 \quad -3$

$\quad\quad -1 \quad -2 \quad 3$

$1 \quad 2 \quad -3 \quad 0$

$x^2 + 2x - 3$

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

You try ☺

13. $2x^3 - x^2 - 4x + 3;\ x - 1$

1 | $2 \quad -1 \quad -4 \quad 3$

$\quad\quad 2 \quad 1 \quad -3$

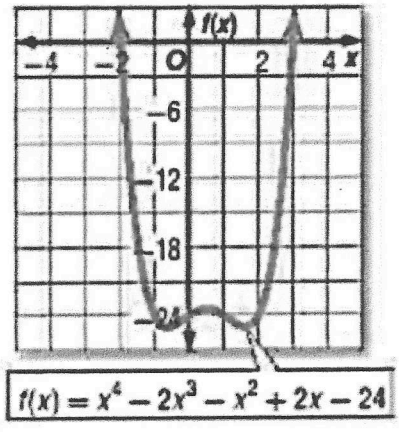
$2 \quad 1 \quad -3 \quad 0$

$2x^2 + 1x - 3$

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

Use the graph to find all of the factors for each polynomial function.

14.



$f(x) = x^4 - 2x^3 - x^2 + 2x - 24$

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

-2 | $1 \quad -2 \quad -1 \quad 2 \quad -24$

$\quad\quad -2 \quad 8 \quad -14 \quad 24$

3 | $1 \quad -4 \quad 7 \quad -12 \quad 0$

$\quad\quad 3 \quad -3 \quad 12$

$1 \quad -1 \quad 4 \quad 0$

$x^2 - x + 4$

doesn't factor