Solving Higher Order by Factoring (5.4)

Warm Up:

Please choose 4 to complete.

Factor.

1.) $y^4 - 14y^2 + 45$

$(y^2-9)(y^2-5)$

$(y+3)(y-3)(y^2-5)$

2.) $x^3 - 4x^2 + 4x - 16$

$x^2(x-4) + 4(x-4)$

$(x^2+4)(x-4)$

3.) $\sqrt{125x^3} - \sqrt{216}$

$a \qquad b$

$(a-b)(a^2+ab+b^2)$

$a = 5x \qquad b = 6$

$(5x-6)(25x^2+30x+36)$

Solve by factoring.

4.) $x^3 - 5x^2 - 9x + 45 = 0$

$x = \pm 3, 5$

5.) $8x^3 + 27 = 0$

$(a+b)(a^2-ab+b^2)$

$a = 2x \qquad b = 3$

$(2x+3)(4x^2-6x+9)$

6.) $2x^3 - 32x = 0$

$2x(x^2-16) = 0$

$2x(x+4)(x-4) = 0$

$2x = 0 \quad x = -4$

$x = 0 \quad x = 4$

Homework Check:

4. $6b^2(5b - 9)$

6. $z(z - 12)(z + 6)$

10. $(x + 2)(x^2 - 2x + 4)$

12. $(3m + 1)(9m^2 - 3m + 1)$

14. $(3a - 10)(9a^2 + 30a + 100)$

20. $(n - 3)(n + 3)(n + 5)$

22. $(s - 4)(5s - 1)(5s + 1)$

24. $(x^2 + 5)(x^2 - 5)$

26. $(s^2 - 3)(3s^2 + 8)$

32.) 0, 5
34.) -3, -1, 1
36.) -1, 1
38.) -3
40.) 0, -3/4, 3/4

RALLY COACH

- 1 paper and pencil per pair.
- Shoulder partners

- *Partner A solves the first problem*
- *Partner B watches and listens, checks, coaches if necessary, and praises*
- *Partner B solves the next problem*
- *Partner A watches and listens, checks, coaches if necessary, and praises*
- *Continue until all questions are completed or time is up.*

Algebra 2 Trig Daily Learning Target Quiz
Unit 3 - Day 4

1.) Factor: $2x^4 - 16x$	2.) Factor: $27x^3 + 45x^2 - 3x - 5$
3.) Factor: $16x^4 - 81$	4.) Solve: $4x^5 - 40x^3 + 36x = 0$

Alg2T Day 5 Extra Credit

Which of the following is NOT a solution of $(x-3)(x-1)(x+3)(x+7)=0$?

F. -7
G. -3
H. 1
J. 3
K. 7

Yellow Solving WS

-Due Friday

CH 5 Day 2
Polynomials
(5.4/5.5) Solving Higher Order when NOT Factorable

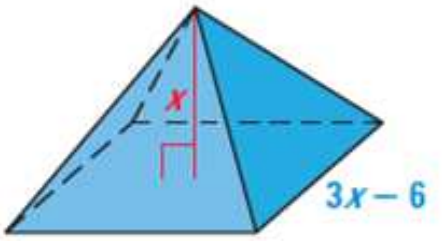
-Solving polynomial cannot be factored.

-Synthetic Division.

I. Solve by Factoring -Application

What is the height in feet of the sculpture?

V= 48 cubic feet



$V=(1/3)Bh$

$48=\frac{1}{3}(3x-6)(3x-6)x$

$48=\frac{1}{3}(9x^2-18x-18x+36)x$

$48=\frac{1}{3}x(9x^2-36x+36)$

$48=3x^3-12x^2+12x$

$-48 \quad -48$

$0=3x^3-12x^2+12x-48$

$0=3(x^3-4x^2+4x-16)$

$0=(x^3-4x^2)+(4x-16)$ Example

$0=x^2(x-4)+4(x-4)$

$(x^2+4)(x-4)=0$

$x=4$

$x^2+4=0$

$-4 \quad -4$

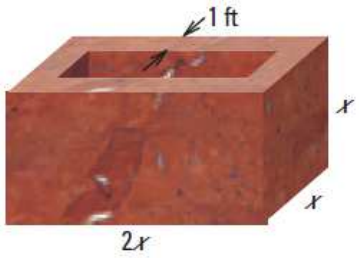
$\sqrt{x^2}=\sqrt{-4}$

$x=\pm 2i$

I. Solve by Factoring -Application

CITY PARK You are designing a marble basin that will hold a fountain for a city park. The basin's sides and bottom should be 1 foot thick. Its outer length should be twice its outer width and outer height.

What should the outer dimensions of the basin be if it is to hold 36 cubic feet of water?



Solution

Volume (cubic feet)	=	Interior length (feet)	·	Interior width (feet)	·	Interior height (feet)
36	=	$(2x - 2)$	·	$(x - 2)$	·	$(x - 1)$

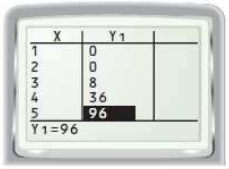
Example

Using a Table One alternative approach is to write a function for the volume of the basin and make a table of values for the function. Using the table, you can find the value of x that makes the volume of the basin 36 cubic feet.

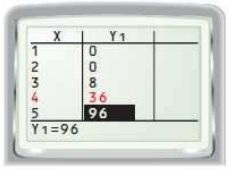
STEP 1 **Write** the function. From the diagram, you can see that the volume y of water the basin can hold is given by this function:

$$y = (2x - 2)(x - 2)(x - 1)$$

STEP 2 **Make** a table of values for the function. Use only positive values of x because the basin's dimensions must be positive.



STEP 3 **Identify** the value of x for which $y = 36$. The table shows that $y = 36$ when $x = 4$.



▸ The volume of the basin is 36 cubic feet when x is 4 feet. So, the outer dimensions of the basin should be as follows:

Length $= 2x = 8$ feet

Width $= x = 4$ feet

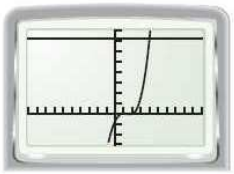
Height $= x = 4$ feet

Using a Graph Another approach is to make a graph. You can use the graph to find the value of x that makes the volume of the basin 36 cubic feet.

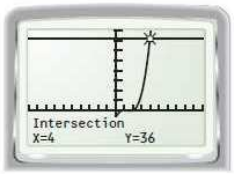
STEP 1 **Write** the function. From the diagram, you can see that the volume y of water the basin can hold is given by this function:

$$y = (2x - 2)(x - 2)(x - 1)$$

STEP 2 **Graph** the equations $y = 36$ and $y = (x - 1)(2x - 2)(x - 2)$. Choose a viewing window that shows the intersection of the graphs.



STEP 3 **Identify** the coordinates of the intersection point. On a graphing calculator, you can use the *intersect* feature. The intersection point is (4, 36).



▸ The volume of the basin is 36 cubic feet when x is 4 feet. So, the outer dimensions of the basin should be as follows:

Length $= 2x = 8$ feet

Width $= x = 4$ feet

Height $= x = 4$ feet

Synthetic Division:

$$ax^3+bx^2+cx+d \div x-k$$

II. Synthetic Division

KEY CONCEPT *For Your Notebook*

Remainder Theorem

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

1.) $3x^3+17x^2+21x-11$ divided by $x+3$

$x+3=0$, $x=-3$

-3	3	17	21	-11
		-9	-24	9
multiply	3	8	-3	-2 Reminder

$3x^2+8x-3-\frac{2}{x+3}$

Example

2.) $5x^3+18x^2+7x-6$ divided by $x+1$ → Yes solution

$x+1=0$, $x=-1$

-1	5	18	7	-6
		-5	-13	6
multiply	5	13	-6	0

$5x^2+13x-6$

a·c: -30; factors: 15 and -2; b: 13

$(5x^2+15x)(-2x-6)$

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

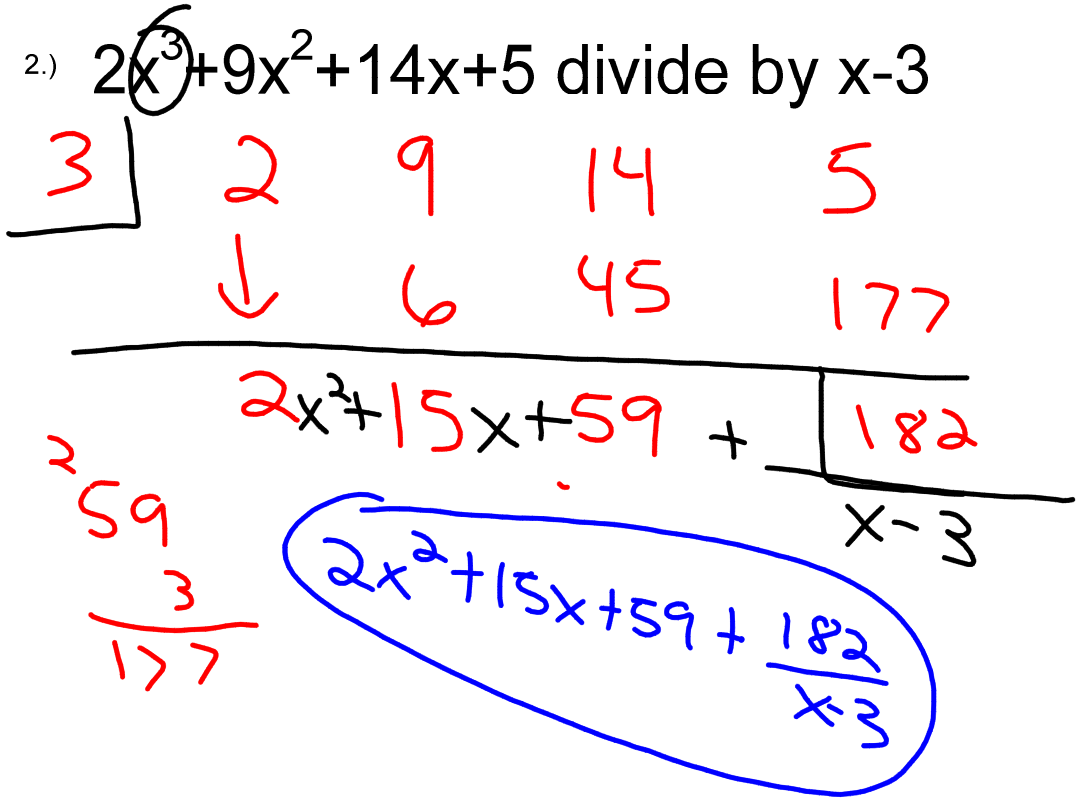
$(5x-2)(x+3)$

$5x-2=0$, $x+3=0$

$x=-1$, $x=\frac{2}{5}$, $x=-3$

II. Synthetic Division

2.) $2x^3+9x^2+14x+5$ divide by $x-3$



II. Synthetic Division

Example

$x^4 - 6x^3 + 0x^2 - 40x + 33$

2.) $(x^4-6x^3-40x+33)\div(x-7)$

7	1	-6	0	-40	33
	↓	7	7	49	63
	1	1	7	9	96

$1x^3+1x^2+7x+9+\frac{96}{x-7}$

III. Factor using synthetic division

KEY CONCEPT *For Your Notebook*

Factor Theorem

A polynomial $f(x)$ has a factor $x - k$ if and only if $f(k) = 0$.

1.) $2x^3-11x^2+3x+36$; $x-3$

Example

$3 \mid 2 \quad -11 \quad 3 \quad 36$

$\quad\quad 6 \quad -15 \quad -36$

$2 \quad -5 \quad -12 \quad 0$

-24, $-8 \cdot 3$, -5

$2x^2-5x-12$

$(2x^2-8x)(3x-12)$

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

$(2x+3)(x-4)=0$

$x=-\frac{3}{2}$ $x=4$ $x=3$

III. Factor using synthetic division TOYO:

2.) $3x^3-4x^2-28x-16$; $x+2$

III. Factor using synthetic division

2.) $3x^3-4x^2-28x-16$; $x+2$

Assignment: Unit Plan Day 2

Yellow Factoring ws
(Red-due 10/19 Blue-due 10/18)