

*Section 2.6*  
*Solving by Factoring*

1) Group

$$x^3 + 4x^2 - 9x - 36 = 0$$

$$\underbrace{x^3 + 4x^2}_{x^2(x+4)} - \underbrace{9x - 36}_{-9(x+4)} = 0$$

$$x^2(x+4) - 9(x+4) = 0$$

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

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

set = 0

$x = -4, -3, 3$

Cubic eq = 3 roots

2) GCF

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

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

a=1  
factor →

-3	-1
3	2

$$x(x+3)(x-1) = 0$$

$x = 0 \quad x = -3 \quad x = 1$

Review...

Factor  $x^2 - 3x - 4 = 0$

<del> <table style="margin: 0 auto;"> <tr><td style="text-align: center;">-4</td><td style="text-align: center;">1</td></tr> <tr><td style="text-align: center;">-3</td><td style="text-align: center;">-1</td></tr> </table> </del>	-4	1	-3	-1	$(x-4)(x+1) = 0$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <math>x = 4 \quad x = -1</math> </div>	Quadratic = 2 roots
-4	1					
-3	-1					

3) Rewrite in Quadratic Form

a)  $x^4 - 3x^2 - 4 = 0$

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

<del> <table style="margin: 0 auto;"> <tr><td style="text-align: center;">-4</td><td style="text-align: center;">1</td></tr> <tr><td style="text-align: center;">-3</td><td style="text-align: center;">-1</td></tr> </table> </del>	-4	1	-3	-1	$(x^2 - 4)(x^2 + 1) = 0$
-4	1				
-3	-1				

$x^2 - 4 = 0$ $\begin{matrix} +4 & +4 \\ \sqrt{x^2} & = \sqrt{4} \end{matrix}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <math>x = \pm 2</math> </div>	$x^2 + 1 = 0$ $\begin{matrix} -1 & -1 \\ \sqrt{x^2} & = \sqrt{-1} \end{matrix}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <math>x = \pm i</math> </div>
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Quartic = 4 roots

b)  $2x^4 - x^2 - 3 = 0$

$$\sqrt{(x^2)^2 - x^2 - 3} = 0$$

<del> <table style="margin: 0 auto;"> <tr><td style="text-align: center;">-3</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">-1</td><td style="text-align: center;">-1</td></tr> </table> </del>	-3	2	-1	-1	a=2 $2x^4 - 3x^2 + 2x^2 - 3 = 0$
-3	2				
-1	-1				

\*new  $x^2$  terms

$$x^2(2x^2 - 3) + 1(2x^2 - 3) = 0$$

$$(2x^2 - 3)(x^2 + 1) = 0$$

$2x^2 - 3 = 0$ $\frac{2x^2}{2} = \frac{3}{2}$ $x^2 = \frac{3}{2}$ $x = \pm \sqrt{\frac{3}{2}} = \pm \frac{\sqrt{6}}{2}$	$x^2 + 1 = 0$ $\begin{matrix} -1 & -1 \\ x^2 & = -1 \end{matrix}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <math>x = \pm i</math> </div>
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## Rational Root Theorem

- Finds rational numbers that are solutions of polynomial equations
- $\frac{p}{q}$  is a solution where:
  - \*p is a factor of the constant
  - \*q is a factor of the leading coefficient

4) Solve  $3x^3 + 8x^2 - 9x + 2 = 0$

p:  $\pm 1 \pm 2$

q:  $\pm 1 \pm 3$

$$\frac{p}{q} = \pm 1 \pm \frac{1}{3} \pm \frac{2}{3} \pm \frac{2}{1}$$

\*if it is a factor then Rem=0

	3	8	-9	2
1	3	11	2	4
-1	3	5	-14	16
$\frac{1}{3}$	3	9	-6	0=R
$-\frac{1}{3}$				

therefore  $x = \frac{1}{3}$  1 root

$3x^2 + 9x - 6 = 0$

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

$a = 1$   
 $b = 3$   
 $c = -2$

$$\frac{-3 \pm \sqrt{9 - 4(1)(-2)}}{2(1)} = \frac{-3 \pm \sqrt{17}}{2} \text{ 2 roots}$$

Total of 3 roots

~~$\frac{-2}{3}$~~

# Homework

p83 #1 - 21 odd

Skip #11