Numbers that could make f(x) = 0 are of the form p/q, where p is a factor of the constant term and q is a factor of the leading coefficient

**4.1 Solving Polynomial Equations**



Recall how we solve quadratic equations by looking at the textbox on the left.

We will use similar steps for solving polynomial equations of degree 3 and 4.

**Example 1:** Determine the solution to $x^{3} – 6x -6 = 3$

**Step 1:** Bring everything to one side just as you would with a quadratic equation so that one side is 0.

**Step 2:** Factor using whatever method(s) possible – factor by grouping, factor theorem and long division, quadratic formula, etc.

1. Factor theorem and Long division



1. Quadratic formula $(x-3) (x^{2} + 3x+ 3) = 0$

$$x=\frac{-b\pm \sqrt{b^{2}-4ac}}{2a}$$

$$x=\frac{-3\pm \sqrt{3^{2}-4\left(1\right)(3)}}{2(1)}$$

 No solutions since determinant is less than zero.

**Step 3:** Determine zeroes/roots – in doing so we will find the solutions to the equation.

**Example 2:** Solve $4x^{3}-12x^{2}=x-3$. Hint: Follow the same steps as above.

**Check your solution on page 198 of the textbook.**

Company A’s cost can be found using

C=30 +0.02n

Company B’s cost can be found using

C=50 + 0.01n

When will the two companies charge the same?

30 + 0.02n =50 + 0.01n

Then solve for n.

**Example 3:** The paths of two orcas playing in the ocean are modelled by two scientists. The first orca’s path could be modelled by the equation $h\left(t\right)= 2t^{4}-17t^{3}+ 27t^{2}- 252t+232 $and the second by$h\left(t\right)= 20t^{3}- 200t^{2}+ 300t-200 $, where h is their height and t is the time in seconds during the first 8 seconds of play. Over the first 8 seconds, when are the two orcas at the first height?

**Step 1:** Equate the two to find when their heights are the same as was done in the example from grade 9 on the right.

**Step 2:** As we did with quadratic equations, move everything to one side so that one side equals zero.

**Step 3:** Factor (use the factor theorem – hint f(4) =0)

**Step 4:** Use factor theorem again to factor the quotient – hint f(9) = 0

**Step 5:** Use quadratic formula to factor the last bit.

**Step 6:** Find the zeros/roots – these will be the solutions to the problem.

**Check your answer on page 201 in the textbook.**

**Example 4:** Solve each.

1. $2x^{6}+ x^{4}= -6$ b) $x^{3}-5x+4 $ = 0 c) $3x^{3}-10x^{2}=-9x+2 $ d) $8x^{5}-8x^{4}-16x^{3}-125x^{2}+125x+250=0$

**See page 202-203 for similar examples if you need help!**

**Homework: pg 204 #6-15**

Numbers that could make f(x) = 0 are of the form p/q, where p is a factor of the constant term and q is a factor of the leading coefficient

Explain what this means if you want to use factor theorem on $3x^{3}-10x^{2}+9x-2 $

Numbers that could make f(x) = 0 are of the form p/q, where p is a factor of the constant term and q is a factor of the leading coefficient

Explain what this means if you want to use factor theorem on $3x^{3}-10x^{2}+9x-2 $

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Numbers that could make f(x) = 0 are of the form p/q, where p is a factor of the constant term and q is a factor of the leading coefficient

Explain what this means if you want to use factor theorem on $3x^{3}-10x^{2}+9x-2 $