**The Function *f*(x)=x3+2x2-5x-6 has x-intercepts at -3, -1, 2**

**What is the y-value at the x-intercept?**

y=0 at the x-intercept

**What is the value of the function at the x-intercept?**

Y=*f*(x)=0

**This is why x-intercepts are called zeros**

**The function is perfectly divisible by its factors**

*f*(x)=x3+2x2-5x-6

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

[Note: last term in each bracket multiply to get last term in function 3 x 1 x (-2) = -6]

**Ex1:**

Factor x3-x2-14x+24

1. Factors of 24 1
2. Use *Remainder Theorem* to find first zero

*f*(1)=10

*f*(-1)= 36

*f*(2)= 0 \*Perfectly divisible into x3-x2-14x+24, therefore (x-2) is a factor

1. Use synthetic division to divide( x3-x2-14x+24)

You get x2+x-12 R0

1. Factor the quadratic x2+x-12 = (x+4)(x-3)

Therefore the factors of x3-x2-14x+24 are (x+4)(x-3)(x-2)

**EX2:**

**Factor *g*(x)=x3+9x2+5x-18**

1. Factors of -18 are
2. Use *Remainder Theorem* to find first zero

*f*(1)

*f*(-1)

*f*(2)

*f*(-2)= 0 \*Perfectly divisible First zero is (x+2)

1. Use synthetic division to divide

You get x2+7x-9

Since the quadratic can’t be factored the factors of ***g*(x)=x3+9x2+5x-18 = (x+2)( x2+7x-9)**

**The Factor Theorem**

**(x-p) is a factor of *f*(x) if and only if *f*(p)=0**

**Steps to Factoring Polynomials**

1. Test factors of the constant term for *f*(p)=0
2. Divide the factor found in (1.)
3. Factor the Polynomial found in (2.)

**EX3:**

**Factor fully: 3x3+2x2-7x+2**

Now we factor (factor of 2/factor of 3)

*f*(1)=0

Use synthetic division to divide 3x3+2x2-7x+2 / (x-1)

And you get: 3x2+5x-2

Which can factor to (x+2)(3x-1)

*f*(x) = (x+2)(3x-1)(x-1)