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## The Factor Theorem

If  $f(x)$  is a polynomial where

$$f(x) \equiv a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0$$

If  $f(x) \equiv x^2 - 3x - 4$  }  $(x-4)$  is a factor  $\Leftrightarrow f(4) = 0$   
 $\equiv (x-4)(x+1)$  }  $(x+1)$  is a factor  $\Leftrightarrow f(-1) = 0$

If  $f(x) \equiv 2x^3 - x^2 - 10x + 8$  }  $(x-2)$  is a factor  $\Leftrightarrow f(2) = 0$   
 $\equiv (x-2)(2x^2 + 3x - 4)$

In general  $f(x) \equiv (x-p)(\dots\dots)$  }  $(x-p)$  is a factor  $\Leftrightarrow f(p) = 0$   
or  $f(x) \equiv (x+q)(\dots\dots)$  }  $(x+q)$  is a factor  $\Leftrightarrow f(-q) = 0$

If  $f(x)$  is a polynomial and  $f(p) = 0$  then  $x-p$  is a factor of  $f(x)$   
or  
If  $f(x)$  is a polynomial and  $f(-q) = 0$  then  $x+q$  is a factor of  $f(x)$

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