Dividing Polynomials

$$\frac{2x^2+x-3}{x-1} \xrightarrow{=} \begin{array}{r|l} & 2x+3 \\ \hline x-1 & 2x^2+x-3 \\ 2x\times -1 & 2x^2-2x \\ \hline & \quad 3x-3 \\ & \quad 3x-3 \\ \hline \hline \end{array}$$

$$\frac{2x^2}{x}=2x$$

$$x-(-2x)=3x$$

$$\begin{array}{r|l} & 233 \\ \hline 4 & 932 \\ \hline & 8 \\ \hline & 13 \\ \hline & 12 \\ & 12 \\ \hline & \ 12 \\ & \ 12 \\ \hline \hline \end{array}$$

Standard long division.

The same method applies, ie/.

$$\frac{3x^3+x^2+3x+5}{x+1} \xrightarrow{=} \begin{array}{r|l} & 3x^2-2x+5 \\ \hline x+1 & 3x^3+x^2+3x+5 \\ & 3x^3+3x^2 \\ \hline & \quad -2x^2+3x \\ & \quad -2x^2-2x \\ \hline & \qquad 5x+5 \\ & \qquad 5x+5 \\ \hline \hline \end{array}$$

$$\frac{x^2}{x}=x$$

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

Polynomial Division

9/10/08

$$\frac{x^3 - 3x^2 + 4x - 2}{(x+1)}$$

$$x^2 - 4x + 8$$

$$x+1 \,\big)\, \boxed{x^3 - 3x^2 + 4x - 2}$$

$$x^3 + x^2$$

$$-4x^2 + 4x$$

$$-4x^2 \boxed{-4x}$$

$$8x - 2$$

$$8x \boxed{+8}$$

$$-10$$

$$\left.\begin{matrix} x^2 \\ x \\ x \end{matrix}\right\} x^3$$

$$= \frac{4 \times x \times \cancel{x}}{\cancel{x}}$$

$$= -4x$$

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

$$+4x + 4x$$

$$8x$$

$$= x^2 - 4x + 8 - \frac{10}{(x+1)}$$

$$\frac{2x^2 + xy - y^2}{x+y}$$

$$(2x - y)$$

$$2x - y$$

$$x+y \,\big)\, 2x^2 + xy - y^2$$

$$2x^2 + 2xy$$

$$-xy - y^2$$

$$-xy - y^2$$

$$x^2 - xy + y^2$$

$$x+y \,\big)\, x^3 + 0x^2y + 0xy^2 + y^3$$

$$x^3 + x^2y$$

$$-x^2y + 0xy^2$$

$$(0xy - (-xy)) \rightarrow \quad -x^2y - xy^2$$

$$xy^2 + y^3$$

$$xy^2 + y^3$$

$$\frac{6x^2+7x-5}{x-1}$$

$x \times x = x^2$

$$x-1\overline{\smash{)}\,6x^2+7x-5}$$ with quotient $6x$

~~$6x^2-6x$~~

$$\frac{6\times x\times \cancel{x}}{\cancel{x}}$$

$7 \times x$

$$x-1\overline{\smash{)}\,6x^2+7x\;-5}$$ with quotient $6x+13+8/x-1$

$6x \quad 7\cancel{x} \quad -5\cancel{x}$

$\frac{x^2}{6x} \quad \cancel{x^2} \quad 6\cancel{x}$

-1

-6

$-1x$

$+13$

$$x-1\overline{\smash{)}\,6x^2+7x-5}$$ with quotient $6x+13$

~~$6x^2$~~

$6x + 7x$

$+13\cancel{x}$

13

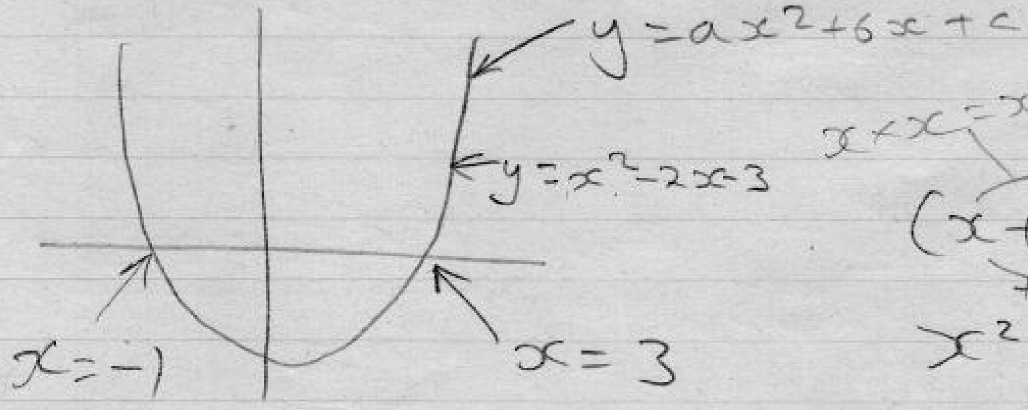
35

4.2

FACTOR THEROM.

linear $y=Mx+c$

quatatic $y=ax^2+bx+$



$x \times x = x^2 \quad +1x-3$

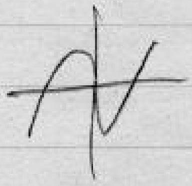
$(x+1)(x-3)=0$

$+1x \quad -3x$

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

$\therefore x+1=0 \qquad \therefore x-3=0$

$$x^3 - 2x^2 - 5x + 6 = 0$$



$$(x-1)(x^2 - x - 6) = 0$$

	x^3	$-2x^2$	$-5x$	$+6$	$=0$
$f(1)$	1	-2	-5	$+6$	$=0$

$$x^2 - x - 6$$

$$x - 1 \,\big)\, \cancel{x^3} - 2x^2 - 5x + 6$$

$$\underline{\cancel{x^3} - x^2}$$

$$-x^2 - 5x$$

$$\underline{\cancel{-x^2} + x}$$

$$-6x + 6$$

$$-5-(1)=-6$$

$$\underline{\underline{\cancel{-6x+6}}}$$

$$x^2 = (x \times x^3)$$

$$-x^2 = (x^2 \times -1)$$

$$(-2x^2 - (-x^2))$$

$$\left(\frac{-x \times x}{\cancel{x}}\right)$$

$$-)$$

$$\frac{-6 \times x}{\cancel{x}}$$

REMAINDER THEROM

FIND THE REMAINDER OF...

$$\frac{3x^2 - 4x + 2}{x - 2}$$

$$f(2) = 3 \times 2^2 - 4 \times 2 + 2$$

$$= 12 - 8 + 2 = \underline{\underline{6}}$$

remainder is $\frac{6}{x-2}$

$$3x + 2$$

$$x - 2 \,\big)\, \cancel{3x^2} - 4x + 2$$

$$\underline{\cancel{3x^2} - 6x}$$

$$2x + 2$$

$$\underline{2x - 4}$$

$$\underline{6}$$

EX/

$ax^3+bx^2+cx+d=0$

In the equation above, a, b, c and d are constants. If the equation has roots −1, −3 and 5, which of the following is a factor of ax^3+bx^2+cx+d?

a) $x-1$
b) $x+1$
c) $x-3$
d) $x+5$

Roots of an equation are values of x which when plugged into equation ax^3+bx^2+cx+d gives you 0 as a result.

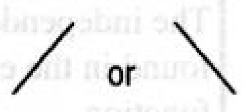
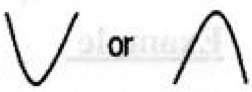
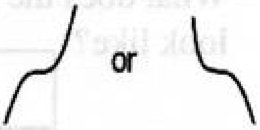
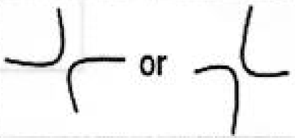
−1, −3 and 5 are given as roots, so $x+1$, $x+3$ and $x-5$ should be factors.

Its form is $x-a$ where a is the root, therefore, it implys $x=-1$, $x=-3$ and $x=5$, or $x+1=0$, $x+3=0$ and $x-5=0$ are factors of the equation.

$\therefore$ the answer is b : $x+1$

check: $x=-1$ $\therefore$ $x+1=0 \rightarrow -1+1=0$ ✓
$x=-3$ $\therefore$ $x+3=0 \rightarrow -3+3=0$ ✓
$x=+5$ $\therefore$ $x-5=0 \rightarrow 5-5=0$ ✓

I

Types of function	General form	Highest power of variable x	Shape of the function
Linear	$y = ax + b$	1	
Quadratic	$y = ax \ + bx + c$	2	
Cubic	$y = ax^3 + bx^2 + cx + d$	3	
Reciprocal	$y = \frac{a}{x}$	-1	

Polynomial Functions

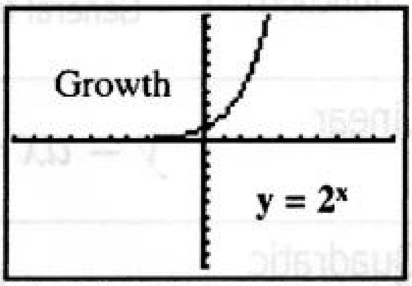
Degree	Name	Example
0	Constant	5
1	Linear	$2x+3$
2	Quadratic	$x^2 - x + 5$
3	Cubic	$3x^3 + 23$
4	Quartic	$x^4 + 2x^3 - 3$
5	Quintic	$x^5 + 2x^3 - .5x + 3$

II

Exponential Functions

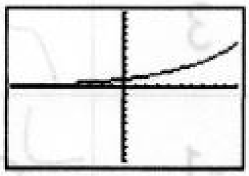
$y = a^x$

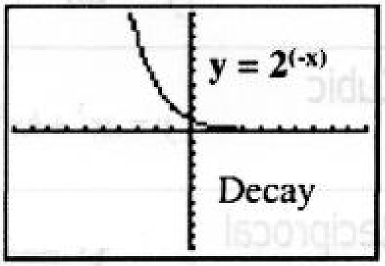
The independent variable (x) is found in the exponent of the function



Example:

What does the graph of $y = 2^{(.25x)}$ look like?

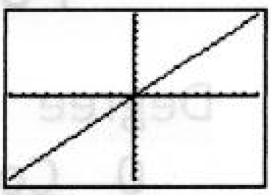




Families of Functions

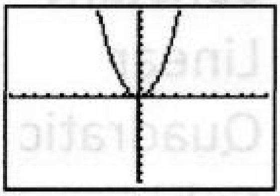
$y = x$

Linear function (Line)



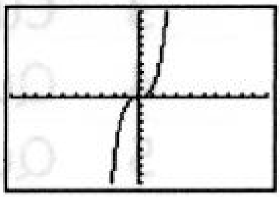
$y = x^2$

Quadratic Function (Parabola)



$y = x^3$

Cubic Function



$y = 1/ x$

Reciprocal function