Math 135 - Spring 2012 **Synthetic Division Worksheet Solutions**

1. Perform the division. List the quotient and remainder.

   (a) $\frac{3x^2-11x+5}{x-4}$

   Answer

[4]	3	-11	5
	0	12	4
	3	1	[9]

   Therefore, $3x^2 - 11x + 5 = (x-4)(3x+1) + 9$ where $3x+1$ is the quotient and 9 is the remainder.

   (b) $\frac{5x^5+3x^3+1}{x+2}$

   Answer

[-2]	5	0	3	0	0	1
	0	-10	20	-46	92	- 184
	5	-10	23	-46	92	[-183]

   Therefore, $5x^5 + 3x^3 + 1$ = $(5x^4 - 10x^3 + 23x^2 - 46x + 92)(x+2) - 183$ where $5x^4 - 10x^3 + 23x^2 - 46x + 92$ is the quotient and -183 is the remainder.

   (c) $\frac{9x^3+14x-6}{3x-2}$

   Answer

[$\frac{2}{3}$]	9	0	14	-6
	0	6	4	12
	9	6	18	[6]

   Therefore, $9x^3 + 14x - 6 = (9x^2 + 6x + 18)(x - \frac{2}{3}) + 6$ where $9x^2 + 6x + 18$ is the quotient and 6 is the remainder.

2. What is the remainder of the division of $p(x)$ by $x - 3$ if:

(a) $p(x) = 3x^4 + 3x - 1$

Answer

[3]	3	0	0	3	-1
	0	9	27	81	252
	3	9	27	84	[251]

Therefore, the remainder is $p(3) = 251$.

(b) $p(x) = 7x^5 - 500x + 3$

Answer

[3]	7	0	0	0	-500	3
	0	21	63	189	567	201
	7	21	63	189	67	[204]

Therefore, the remainder is $p(3) = 204$.

(c) $p(x) = 4x^4 + x$

Answer

[3]	4	0	0	1	0
	0	12	36	108	327
	4	12	36	109	[327]

Therefore, the remainder is $p(3) = 327$.

3. Find all roots.

   (a) $x^3 - 2x^2 - 5x + 6$

   Answer

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

   and therefore the roots are $\{-2, 1, 3\}$.

   (b) $x^4 + 2x^3 - 9x^2 - 2x + 8$

   Answer

   $$x^4 + 2x^3 - 9x^2 - 2x + 8 = (x-1)(x+1)(x-2)(x+4)$$

   and therefore the roots are $\{-4, -1, 1, 2\}$.