Math 103 Exam #2 Key (Fall 2014)

1a $r + 13$

1b $2x^5 - x^4 - 2x^3 + 1$

2a $-6x^8y^4$

2b $3z^2 + wz - 4w^2$

2c $6n^3 - 8n^2 - 2n + 9n^2 - 12n - 3 = 6n^3 + n^2 - 14n - 3$

3a Apply long division to obtain: $\dfrac{p^3 + 3p^2 - 4}{p + 2} = p^2 + p - 2$, as shown below:

$$
\begin{array}{r|l}
 & p^2 + p - 2 \\
\hline
p + 2 & p^3 + 3p^2 \qquad - 4 \\
 & -p^3 - 2p^2 \\
\hline
 & p^2 \\
 & -p^2 - 2p \\
\hline
 & -2p - 4 \\
 & 2p + 4 \\
\hline
 & 0
\end{array}
$$

3b Apply long division to obtain: $\dfrac{9k^4 + 12k^3 - 4k - 1}{3k^2 - 1} = 3k^2 + 4k + 1$, as shown below:

$$
\begin{array}{r|l}
 & 3k^2 + 4k + 1 \\
\hline
3k^2 - 1 & 9k^4 + 12k^3 \qquad - 4k - 1 \\
 & -9k^4 \qquad + 3k^2 \\
\hline
 & 12k^3 + 3k^2 - 4k \\
 & -12k^3 \qquad + 4k \\
\hline
 & 3k^2 \qquad - 1 \\
 & -3k^2 \qquad + 1 \\
\hline
 & 0
\end{array}
$$

4 $16zn^3(zn^3 + 4n^4 - 2z^2)$

5 $2(5m + q) + k(5m + q) = (5m + q)(2 + k)$

6a $z^2 + 2z - 24 = (z + 6)(z - 4)$

6b $8r^2 + 34r + 35 = (4r + 7)(2r + 5)$

6c $14c^2 - 17cd - 6d^2 = (7c + 2d)(2c - 3d)$

6d $18a^2 - 98b^2 = 2(9a^2 - 49b^2) = 2[(3a)^2 - (7b)^2] = 2(3a - 7b)(3a + 7b)$

6e We have

$$343h^3 + 125u^3 = (7h)^3 + (5u)^3 = (7h + 5u)[(7h)^2 - (7h)(5u) + (5u)^2],$$

and therefore

$$343h^3 + 125u^3 = (7h + 5u)(49h^2 - 35hu + 25u^2).$$

6f We have

$(16m^2 - 8m + 1) - n^2 = (4m - 1)^2 - n^2 = [(4m - 1) - n][(4m - 1) + n] = (4m - n - 1)(4m + n - 1).$

7a Get zero on one side: $x^2 - 18x + 80 = 0$. Factor: $(x - 8)(x - 10) = 0$. So either $x - 8 = 0$ or $x - 10 = 0$. Solution set is $\{8, 10\}$.

7b Factor: $-3y(y - 9) = 0$. So either $-3y = 0$ or $y - 9 = 0$. Solution set is $\{0, 9\}$.

7c Factor by grouping: $t(2t + 5) - (2t + 5) = 0$, and then $(2t + 5)(t - 1) = 0$. So either $2t + 5 = 0$ or $t - 1 = 0$. Solution set is $\{-5/2, 1\}$.