Math 120 Exam #1 Key (Fall 2013)

1 $\dfrac{-(-5+2)^2-3(-10)}{2-8}=\dfrac{-9+30}{-6}=-\dfrac{21}{6}=-\dfrac{7}{2}$

2a $(u^3-2u^2+5)-2(-7u^3+11u^2)=u^3-2u^2+5+14u^3-22u^2=15u^3-24u^2+5$

2b $15x^4-\dfrac{7}{3}x^3-\dfrac{2}{9}x^2$

2c $(z-3)^3=z^3-9z^2+27z-27$

3 Answer is: $6t^2-3t+5$.

$$
\begin{array}{r|l}
5t+1 & 6t^2-3t+5 \\
\hline
 & 30t^3-9t^2+22t+5 \\
 & -30t^3-6t^2 \\
\hline
 & -15t^2+22t \\
 & 15t^2+3t \\
\hline
 & 25t+5 \\
 & -25t-5 \\
\hline
 & 0
\end{array}
$$

4a $(2t-3)^2$

4b $20p^2-100pq+125q^2=5(4p^2-20pq+25q^2)=5(2p-5q)^2$

4c $k^4-625=(k^2)^2-25^2=(k^2-25)(k^2+25)=(k-5)(k+5)(k^2+25)$

4d $27+8\alpha^3=3^3+(2\alpha)^3=(3+2\alpha)[(3^2-(3)(2\alpha)+(2\alpha)^2]=(3+2\alpha)(9-6\alpha+4\alpha^2)$

5a $\dfrac{q^3+q^2}{7}\cdot\dfrac{49}{q^4+q^3}=\dfrac{q^2(q+1)}{7}\cdot\dfrac{7^2}{q^3(q+1)}=\dfrac{1}{1}\cdot\dfrac{7}{q}=\dfrac{7}{q}$

5b $\dfrac{x^2+x-2}{x^2+3x-4}\div\dfrac{x^2+3x+2}{x^2+4x+3}=\dfrac{(x+2)(x-1)}{(x+4)(x-1)}\cdot\dfrac{(x+3)(x+1)}{(x+2)(x+1)}=\dfrac{x+3}{x+4}$

6 $\dfrac{5}{12x^2y}-\dfrac{7}{6xy^3}=\dfrac{5}{12x^2y}\cdot\dfrac{y^2}{y^2}-\dfrac{7}{6xy^3}\cdot\dfrac{2x}{2x}=\dfrac{5y^2}{12x^2y^3}-\dfrac{14x}{12x^2y^3}=\dfrac{5y^2-14x}{12x^2y^3}$

7 We have

$$\frac{\dfrac{1}{\ell}-\dfrac{1}{\ell+1}}{\dfrac{1}{\ell}+\dfrac{1}{\ell+1}}\cdot\frac{\ell(\ell+1)}{\ell(\ell+1)}=\frac{(\ell+1)-\ell}{(\ell+1)+\ell}=\frac{1}{2\ell+1}.$$

8 Using laws of exponents,

$$\frac{(g^2h^3)^4(gh^4)^{-3}}{g^2h}=\frac{g^8h^{12}g^{-3}h^{-12}}{g^2h}=\frac{g^5}{g^2h}=\frac{g^3}{h}.$$

9 $6w^{-2/3}-5w^{-5/3}=w^{-5/3}(6w-5)$.

10a $\sqrt[4]{81a^8b^4}=3a^2|b|$.

10b $\sqrt[3]{\dfrac{5}{3y}}=\dfrac{\sqrt[3]{5}}{\sqrt[3]{3y}}=\dfrac{\sqrt[3]{5}}{\sqrt[3]{3y}}\cdot\dfrac{\sqrt[3]{9y^2}}{\sqrt[3]{9y^2}}=\dfrac{\sqrt[3]{45y^2}}{\sqrt[3]{27y^3}}=\dfrac{\sqrt[3]{45y^2}}{3y}$.

10c $\dfrac{\sqrt{2}}{\sqrt{3}-\sqrt{2}}\cdot\dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}=\dfrac{\sqrt{6}+2}{3-2}=\sqrt{6}+2.$

11 $4[2x-(3-x)+5]=-6x-28 \;\Rightarrow\; 4(3x+2)=-6x-28 \;\Rightarrow\; 18x=-36 \;\Rightarrow\; x=-2$

12 Solving for x:

$$\frac{x-1}{2a}=\frac{1}{a-b} \;\Rightarrow\; x-1=\frac{2a}{a-b} \;\Rightarrow\; x=\frac{2a}{a-b}+1.$$

13

	Rate	Time	Distance
Upstream	24	t	$24t$
Downstream	36	$6-t$	$36(6-t)$

Equation is $24t=36(6-t)$, which solves to give $t=3.6$ hours. Thus the boat goes $24(3.6)=86.4$ kilometers upstream.

14 Let x be the amount of money loaned to Rudy at 22% interest, so that $120,000-x$ is the amount loaned to Rocko at 35% interest. Add the interest from each investment to get the

total interest of \$36,150:

$$0.22x + 0.35(120,000 - x) = 36,150.$$

Solving yields $x = 45,000$. That is, \$45,000 was loaned to Rudy, and \$75,000 to Rocko.

15a $(4 - 3i)(2 + 7i) = 29 + 22i$

15b $\dfrac{1 - 2i}{2 + i} \cdot \dfrac{2 - i}{2 - i} = -i$