

MATH 120 EXAM #1 KEY (WINTER 2015)

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

$$\mathbf{2a} \quad (u^3 - 2u^2 + 5) - 2(-7u^3 + 11u^2) = u^3 - 2u^2 + 5 + 14u^3 - 22u^2 = 15u^3 - 24u^2 + 5$$

$$\mathbf{2b} \quad 15x^4 - \frac{7}{3}x^3 - \frac{2}{9}x^2$$

$$\mathbf{2c} \quad (z-3)^3 = z^3 - 9z^2 + 27z - 27$$

$$\mathbf{3} \quad \text{Answer is: } 6t^2 - 3t + 5.$$

$$\begin{array}{r} 6t^2 - 3t + 5 \\ 5t + 1 \overline{) 30t^3 - 9t^2 + 22t + 5} \\ \underline{- 30t^3 - 6t^2} \\ -15t^2 + 22t \\ \underline{15t^2 + 3t} \\ 25t + 5 \\ \underline{- 25t - 5} \\ 0 \end{array}$$

$$\mathbf{4a} \quad (2t-3)^2$$

$$\mathbf{4b} \quad 20p^2 - 100pq + 125q^2 = 5(4p^2 - 20pq + 25q^2) = 5(2p-5q)^2$$

$$\mathbf{4c} \quad k^4 - 625 = (k^2)^2 - 25^2 = (k^2 - 25)(k^2 + 25) = (k-5)(k+5)(k^2 + 25)$$

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

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

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

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

7 We have

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

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

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

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

12 Solving for x :

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

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	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 $\frac{1 - 2i}{2 + i} \cdot \frac{2 - i}{2 - i} = -i$