

MATH 120 EXAM #1 KEY (WINTER 2013)

1 $-s^2 - 8t + r^2 = -(-2)^2 - 8(3) + (-4)^2 = -4 - 24 + 16 = -12$

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 $(3v + 2)(4v^2 - 7v + 6) = 12v^3 - 13v^2 + 4v + 12$

2c $(a - 8b)^2 = a^2 - 16ab + 64b^2$

3 Answer is: $2y^2 + y - 1 + \frac{6}{5y + 3}$.

$$\begin{array}{r} 2y^2 + y - 1 \\ 5y + 3 \overline{) 10y^3 + 11y^2 - 2y + 3} \\ \underline{- 10y^3 - 6y^2} \\ 5y^2 - 2y \\ \underline{- 5y^2 - 3y} \\ - 5y + 3 \\ \underline{5y + 3} \\ 6 \end{array}$$

4a $10ab - 6b + 35a - 21 = 2b(5a - 3) + 7(5a - 3) = (5a - 3)(2b + 7)$

4b $9z^2 + 4z - 2$ is prime

4c $32a^2 + 48ab + 18b^2 = 2(16a^2 + 24ab + 9b^2) = 2(4a + 3b)^2$

4d $36k^2 - 81\ell^4 = 9(4k^2 - 9\ell^4) = 9(2k - 3\ell^2)(2k + 3\ell^2)$

4e $1000x^3 + 343y^3 = (10x)^3 + (7y)^3 = (10x + 7y)(100x^2 - 70xy + 49y^2)$

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

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

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

7 We have

$$\frac{1 - \frac{2}{3x}}{9 - \frac{4}{x^2}} = \frac{1 - \frac{2}{3x}}{9 - \frac{4}{x^2}} \cdot \frac{3x^2}{3x^2} = \frac{3x^2 - 2x}{27x^2 - 12} = \frac{x(3x - 2)}{3(3x - 2)(3x + 2)} = \frac{x}{9x + 6}$$

8 $\frac{(r^{-1/5}s^{2/3})^{15}}{r^{-2}} = \frac{r^{-3}s^{10}}{r^{-2}} = \frac{s^{10}}{r}$

9 $t^{-5} - 3t^{-3} = t^{-5}(1 - 3t^2).$

10a $\sqrt{25j^4k^2} = 5j^2|k|.$

10b $\sqrt{8x^5z^8} = 2x^2z^4\sqrt{2x}$

10c $\sqrt[3]{\frac{9}{16r^4}} = \frac{\sqrt[3]{9}}{\sqrt[3]{16r^4}} = \frac{\sqrt[3]{9}}{2r\sqrt[3]{2r}} = \frac{\sqrt[3]{9}}{2r\sqrt[3]{2r}} \cdot \frac{\sqrt[3]{4r^2}}{\sqrt[3]{4r^2}} = \frac{\sqrt[3]{36r^2}}{4r^2}$

10d $\sqrt[4]{\sqrt[3]{5}} = \sqrt[12]{5}$

10e $\sqrt[3]{32} - 5\sqrt[3]{4} + 2\sqrt[3]{108} = 2\sqrt[3]{4} - 5\sqrt[3]{4} + 2 \cdot 3\sqrt[3]{4} = 3\sqrt[3]{4}$

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

12 $ax + b = 3(x - a) \Rightarrow ax + b = 3x - 3a \Rightarrow ax + 3a = 3x - b \Rightarrow a(x + 3) = 3x - b \Rightarrow$
 $a = \frac{3x - b}{x + 3}$

13 Let t be the time elapsed before they are 1.8 miles apart.

	Rate	Time	Distance
Mary	7	t	$7t$
Jane	5	t	$5t$

Equation is $7t - 5t = 1.8$, so that $2t = 1.8$ and thus $t = 1.8/2 = 9/10$ hour.

14 30% of \$200,000 is \$60,000, which leaves \$140,000 left to invest. Let x be the amount invested at 1.5% interest. Equation is

$$0.015x + 0.040(140,000 - x) = 4350.$$

Solving gives $x = 50,000$. Therefore \$50,000 was invested at 1.5%, and \$90,000 at 4%.

$$\mathbf{15} \quad (2 + 5i)(2i - 4) = 4i - 8 + 10i^2 - 20i = 4i - 8 - 10 - 20i = -18 - 16i$$

$$\mathbf{16} \quad \frac{1 + 2i}{1 - 3i} = \frac{1 + 2i}{1 - 3i} \cdot \frac{1 + 3i}{1 + 3i} = -\frac{1}{2} + \frac{1}{2}i$$