.099 TEST 1 SPRING 2014

① $2-7(2x+3)-7(2-3x)$

$= 2-14x-21-14+21x$ 5pts

$= \boxed{7x-33}$

② (a) $(2x-3)(5x+3)$

$= 10x^2+6x-15x-9$ 5pts

$= \boxed{10x^2-9x-9}$

(b) $(7x+4y)^2$ $\quad (a+b)^2 = a^2+2ab+b^2$

$= (7x)^2 + 2(7x)(4y) + (4y)^2$ $\quad (7x)^2 = 7^2x^2 = 49x^2$ 5pts

$= 49x^2+56xy+16y^2$

(c) $(2x-3)(3x^2-5x+9)$ $\quad (2x)(3x^2) = 6x^3$

$= 6x^3-10x^2+18x$

$\quad -9x^2+15x-27$

$\boxed{6x^3-19x^2+33x-27}$ 5pts

③ $a=5,\ b=-9,\ c=-$

$\Rightarrow b^2-4ac = (-9)^2-4(5)(-6)$ 5pts

$= 81+120$

$= \boxed{201}$

④ 5pts

2 | 33462

3 | 16731

3 | 5577

11 | 1859

13 | 169

13

$\boxed{2\cdot 3^2\cdot 11\cdot 13^2}$

⑤ 5pts

$\sqrt{33462}$

$= \sqrt{2\cdot 3^2\cdot 11\cdot 13^2}$

$= 3\cdot 13\sqrt{2\cdot 11}$

$= \boxed{39\sqrt{22}}$

35pts

(6) $\frac{4290}{33462} = \frac{2\cdot3\cdot5\cdot11\cdot13}{2\cdot3^2\cdot11\cdot13^2}$

$\frac{2}{2}=1$, $\frac{3}{3^2}=\frac{1}{3}$, $\frac{11}{11}=1$, $\frac{13}{13^2}=\frac{1}{13}$

$= 1\cdot\frac{1}{3}\cdot5\cdot1\cdot\frac{1}{13} = \boxed{\frac{5}{39}}$ 5pts

2 | 4290
3 | 2145
5 | 715
11 | 143
13

(7) (a) $-5, 3, 11, \ldots$ $d = 3-(-5) = 8$? $11-3=8$ ✓ $11+8 = \boxed{19}$ is next term. 5pts

(b) $-100, 20, -4, \ldots$ $d = 20-(-100) = 120$? $-4-20 = 24$ Not arithmetic.

$r = \frac{20}{-100} = -\frac{1}{5}$? $\frac{-4}{20} = -\frac{1}{5}$ ✓ so, $(-4)(-\frac{1}{5}) = \boxed{\frac{4}{5}}$ is next term

(8) $x = 1000-2p$ & $R = xp$ $\Rightarrow$ $\boxed{R = (1000-2p)p}$ 5pts

(9) (a) $150a^5b^3 - 60a^4b^7 = \boxed{30a^4b^3(5a - 2b^4)}$ 5pts

150: 2 | 150, 3 | 75, 5 | 25, 5

60: 2 | 60, 2 | 30, 3 | 15, 5

GCF $= 2\cdot3\cdot5$

$\frac{2\cdot3\cdot5\cdot5}{2\cdot3\cdot5} = 5$

$\frac{2\cdot2\cdot3\cdot5}{2\cdot3\cdot5} = 2$

(b) $\frac{x^2-3x-10}{(x-5)(x+2)}$ 5pts

$a=1, b=-3, c=-10$

$b^2-4ac = (-3)^2-4(1)(-10)$

$= 9+40 = 49$

$\Rightarrow b^2-4ac = \sqrt{49} = 7$

(c) $9x^2-16 = \boxed{(3x-4)(3x+4)}$ 5pts

$x = \frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-(-3)\pm7}{2(1)} = \frac{3\pm7}{2}$ $\frac{10}{2}=5$, $\frac{-4}{2}=-2$ $\Rightarrow (x-5)(x+2)$

(10) $3x-7=5x+11$

$-5x+7=-5x+7$

$-2x=18$

$x=-\frac{18}{2}=-9=x$ ✓

5 pts

Almost everyone combined steps, which is bad, later.

(11) $\frac{7}{30}+\left(-\frac{5}{42}\right)$

$2\overline{)30}$ $3\overline{)15}$ 5 $\quad$ $2\overline{)42}$ $3\overline{)21}$ 7

$= \frac{7}{2\cdot3\cdot5}\cdot\frac{7}{7}-\frac{5}{2\cdot3\cdot7}\cdot\frac{5}{5}$ $\quad$ LCD $= 2\cdot3\cdot5\cdot7$

$2\overline{)24}$ $2\overline{)12}$ $2\overline{)6}$ 3 5 pts

$= \frac{49}{LCD}-\frac{25}{LCD}=\frac{49-25}{LCD}=\frac{24}{LCD}=\frac{2\cdot2\cdot2\cdot3}{2\cdot3\cdot5\cdot7}$

$= \frac{2\cdot2}{5\cdot7}=\boxed{\frac{4}{35}}$

(12) $\left(70\ \frac{km}{hr}\right)\left(\frac{1000\ m}{1\ km}\right)\left(\frac{100\ cm}{1\ m}\right)\left(\frac{1\ in}{2.54\ cm}\right)$

$\cdot\left(\frac{1\ ft}{12\ in}\right)\left(\frac{1\ mi}{5280\ ft}\right)\approx \boxed{43.49598346\ \frac{mi}{hr}}$ 5 pts

(13) (a) $(x^3y^{-7})(x^{-5}y^2)=x^{3-5}y^{-7+2}=x^{-2}y^{-5}=\boxed{\frac{1}{x^2y^5}}$ 5 pts

(b) $(x^2y^{-3})^{-7}(x^{-5}y^5)^4$

$=(x^{-14}y^{21})(x^{-20}y^{20})$

$=x^{-14-20}y^{21+20}=x^{-34}y^{41}=\boxed{\frac{y^{41}}{x^{34}}}$ 5 pts

099 TEST 1

(c) $\dfrac{5^4 x^7 y^{-5}}{75x^2y^2} = \dfrac{5^4}{3\cdot 5^2}\cdot x^{7-2}y^{-5-2}$

$= \dfrac{5^2}{3}x^5y^{-7} = \boxed{\dfrac{25x^5}{3y^7}}$ 5 pts

$3\overline{)75}$
$5\overline{)25}$
5

$\dfrac{5^4}{5^2} = 5^{4-2} = 5^2$

(d) $\dfrac{(6^{-1}x^2y^3)^{-2}}{(15x^{-2}y^{-5})^4} = \dfrac{(2^{-1}3^{-1}x^2y^3)^{-2}}{(3\cdot 5\,x^{-2}y^{-5})^4}$

$6^{-1} = (2\cdot 3)^{-1} = 2^{-1}\cdot 3^{-1}$

$15 = 3\cdot 5$

$= \dfrac{2^2 3^2 x^{-4}y^{-6}}{3^4\cdot 5^4 x^{-8}y^{-20}} = 2^2\cdot 3^{2-4}\cdot 5^{-4}\cdot x^{-4-(-8)}y^{-6-(-20)}$ 5 pts

$= 4\cdot 3^{-2}\cdot 5^{-4}x^4y^{14} = \boxed{\dfrac{4x^4y^{14}}{3^2\cdot 5^4}} = \dfrac{4x^4y^{14}}{5625}$

(14) $ax^2+bx+c=0 \Longrightarrow$ $\boxed{b^2-4ac}$ is the discriminant 5 pts

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BONUS

(16) For $ax^2+bx+c = (\ \ )^2$, $b^2-4ac=0$ is needed.

(12) For ax^2+bx+c to factor the way the book means by "factor," you need b^2-4ac to be a perfect square, like 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 169, 196, 225, 256

099 TEST 1

BONUS

(2) $ax^2+bx+c=0 \Rightarrow x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

(3) $84x^3-72x^2-245xy+210y$

$=12x^2(7x-6)-35y(7x-6)$

$=\boxed{(7x-6)(12x^2-35y)}$

$84=2\cdot2\cdot3\cdot7$ $\quad 72=2\cdot2\cdot2\cdot3\cdot3$

GCF $=2\cdot2\cdot3=12$

$\dfrac{2\cdot2\cdot3\cdot7}{2\cdot2\cdot3}=7$ $\quad \dfrac{2\cdot2\cdot2\cdot3\cdot3}{2\cdot2\cdot3}=6$

(4) $189x^2-138x-80$

$a=189, b=-138, c=-80$

$b^2-4ac=(-138)^2-4(189)(-80)$

$=79524 \Rightarrow$

$\sqrt{b^2-4ac}=\sqrt{79524}=282$

$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}=\dfrac{138\pm282}{2(189)}$

$=\dfrac{138\pm282}{378}$ $\quad \dfrac{420}{378}=\dfrac{10}{9}$ $\quad \dfrac{-144}{378}=-\dfrac{8}{21}$

Note $\dfrac{189}{9}=21$

$189\left(x-\frac{10}{9}\right)\left(x+\frac{8}{21}\right)$

$=9\cdot21\left(x-\frac{10}{9}\right)\left(x+\frac{8}{21}\right)$

$=9\left(x-\frac{10}{9}\right)(21)\left(x+\frac{8}{21}\right)$

$=\boxed{(9x-10)(21x+8)}$!

$245=5\cdot7\cdot7$ $\quad 210=2\cdot3\cdot5\cdot7$

GCF $=5\cdot7=35$

$\dfrac{5\cdot7\cdot7}{5\cdot7}=7$ $\quad \dfrac{2\cdot3\cdot5\cdot7}{5\cdot7}=6$

(5) $24x^3 375y^6$

$= 3(8x^3 125y^6)$

$= 3(2^3x^3 - 5^3(y^2)^3)$

$= 3((2x)^3 - (5y^2)^3)$

$= 3(2x-5y^2)((2x)^2 + (2x)(5y^2) + (5y^2)^2)$

$= \boxed{3(2x-5y^2)(4x^2 + 10xy^2 + 25y^4)}$

2 | 24	3 | 375
2 | 12	5 | 125
2 | 6	5 | 25
3	5

GCF = 3

$\frac{24}{3} = 8$, $\frac{375}{3} = 125$

(6) $x^3 + 27 = x^3 + 3^3 = \boxed{(x+3)(x^2-3x+9)}$ (3^2)

(7)

$(x-2y)^5 =$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

$1(x)^5(-2y)^0 + 5(x)^4(-2y)^1 + 10(x)^3(-2y)^2 + 10(x)^2(-2y)^3$

$+ 5(x)^1(-2y)^4 + 1(x)^0(-2y)^5$

$= \boxed{x^5 - 10x^4y + 40x^3y^2 - 80x^2y^3 + 80xy^4 - 32y^5}$

(8) $x^2 + 10x + 20 = 0$

$x^2 + 10x + 5^2 = -20 + 25$

$(x+5)^2 = 5$

$x - 5 = \pm\sqrt{5}$

$x = 5 \pm \sqrt{5}$

$\therefore \boxed{(x-(-5+\sqrt{5}))(x-(-5-\sqrt{5}))}$

099 TEST 1 BONUS

(9) $\sqrt{-1}$ = the imaginary unit = i.

(10) "Powers distribute over products."

From # 13 d:

$(6^{-1}x^2y^3)^2 = (6^{-1})^2(x^2)^2(y^3)^2$

The power of 2, outside, distributes over the product of 6^{-1}, x^2 and y^3.

This results in $6^{-2}x^4y^6$, using

$(a^b)^c = a^{bc}$ $\quad (y^3)^2 = y^{(3)(2)} = y^6$

(11) "Products distribute over sums."

$3(2x-7) = (3)(2x) + (3)(-7)$

$= 6x - 21$