MAT 1340 **Writing Project #0, Spring 2024** **Steve Mills**

There is at least one error in these solutions.

1. Simplify $5-2(3x-5)+7(2-3x)$

$5-2(3x-5)+7(2-3x)$

$=5-6x+10+14-21x$

$=\boxed{-27x+29}$

2. Multiply

a. $3(2x^2)(2x+3)(6x-2)$

$3(2x^2)(2x+3)(6x-2)$

$=(6x^2)(12x^2-4x+18x-6)$

$=6x^2(12x^2+14x-6)$

$=\boxed{72x^4+84x^3-36x^2}$

b. $(3x-2)(2x^2-3x+7)$

$=6x^3-9x^2+21x-4x^2+6x-14$

$=\boxed{6x^3-13x^2+27x-14}$

3. Evaluate b^2-4ac if $a=3, b=-7,$ and $c=11$

$b^2-4ac=7^2-4(3)(11)=49-132=\boxed{-83}$

I'll ding you for

$-7^2-4(3)(11)$

This is fine!

$(-7)^2-4(3)(11)$

12 × 11 = 132

132 + 49 = −83

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4. Write $\frac{2310}{660}$ in lowest terms.

$\frac{2310}{660} = \frac{2 \cdot 3 \cdot 5 \cdot 7 \cdot 11}{2^2 \cdot 3 \cdot 5 \cdot 11} = \boxed{\frac{7}{2}}$

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31

2310	660
2	2
3	330
5	3 165
7	5 55
11	11

$\frac{330}{2} = 165$

5. Simplify $\sqrt{37800}$ without using a calculator.

$= \sqrt{2^3 \cdot 3^3 \cdot 5^2 \cdot 7}$

$= \sqrt{2^2 \cdot 2^1 \cdot 3^2 \cdot 3^1 \cdot 5^2 \cdot 7}$

$= 2 \cdot 3 \cdot 5 \sqrt{2 \cdot 3 \cdot 7}$

$= \boxed{30\sqrt{42}}$

37800
2
18900
2
9450
2
4725
3
1575
3
525
3
175
5
35
5
7

6. Factor. if possible:

a. $x^2 - 3x - 10$ $\quad -10 = (-5)(2)$ & $-5+2 = -3$ ✓

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

$= x(x-5) + 2(x-5)$

$= \boxed{(x-5)(x+2)}$

6. Factor. if possible:

b. $9x^2 - 16 = 3^2x^2 - 4^2 = (3x)^2 - 4^2$

$= \boxed{(3x-4)(3x+4)}$

$a^2 - b^2 = (a-b)(a+b)$

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7. Simplify. Assume all variables represent nonzero real numbers. Your final answer should contain only positive exponents.

a. $(a^2b^{-3})(a^{-5}b^2) = a^{2-5}\,b^{-3+2} = a^{-3}b^{-1} = \boxed{\frac{1}{a^3b}}$

b. $(a^2b^{-3})^{-2}(a^{-5}b^2)^4$

$= (a^2b^{-3})^{-2}(a^{-5}b^2)^4$

$= (a^{2(-2)}\,b^{-3(-2)})(a^{-5(4)}\,b^{2(4)})$

$= (a^{-4}b^6)(a^{-20}b^8) = a^{-4-20}\,b^{6+8} = \boxed{\frac{b^{14}}{a^{24}}}$

c. $\dfrac{3^4x^5y^{-2}}{9x^{-3}y^{-7}} = \dfrac{3^4x^{5-(-3)}y^{-2-(-7)}}{3^2} = 3^{4-2}x^8y^{-2+7} = \boxed{3^2x^8y^5}$

$\boxed{= 9x^8y^5}$ either one.

d. $\dfrac{(6x^2y^3)^{-2}}{(15x^{-2}y^{-5})^4} = \dfrac{6^{-2}x^{-4}y^{-6}}{15^4x^{-8}y^{-20}} = \dfrac{1}{6^2\cdot 15^4}\cdot x^{-4+8}y^{-6+20}$

$= \boxed{\dfrac{x^4y^{14}}{1022500}}$

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8. Consider the equation $ax^2 + bx + c = 0$. Write the discriminant.

Discriminant is b^2-4ac = what goes under the radical in the quadratic formula.

B1 $ax^2+bx+c=0 \longrightarrow \boxed{x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}}$

B2 $168x^2+326x-165=0$

$(-165)(168) = -27720$ = Magic #

$326 = 327 - 1$ $\quad -327$ Higher!

$= 336 - 10$ $\quad -3360$ Higher!

$= 426 - 100$ $\quad -42600$ Lower!

$= 376 - 50$ $\quad -18800$ Higher!

$= 401 - 75$ $\quad -30075$ Lower!

$= 386 - 60$ $\quad -23160$ HIGHER

$= 396 - 70$ $\quad -27720$! MAGIC!

$\Rightarrow 168x^2+326x+165 = 168x^2+396x-70x-165$

$168 = 2^3 \cdot 3 \cdot 7$
$396 = 2^2 \cdot 3^2 \cdot 11$ } GCF $= 2^2 \cdot 3 = 12$

$165 = 3 \cdot 5 \cdot 11$
$70 = 2 \cdot 5 \cdot 7$ } GCF $= 5$

$\Rightarrow 12(14x+33) - 5(14x+33) = \boxed{(14x+33)(12x-5)}$

There's also the sledgehammer method using Quadratic Formula & reverse-engineering the factored form.

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B3 $x^3 - 64 = x^3 - 4^3 = \boxed{(x-4)(x^2+4x+16)}$

Difference of cubes

B4 $27x^6 + 125y^6z^9$

$= 3^3(x^2)^3 + 5^3(y^2)^3(z^3)^9$

$= (3x^2)^3 + (5y^2z^3)^3$ Sum of cubes

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

$= \boxed{(3x^2 + 5y^2z^3)(9x^4 - 15x^2y^2z^3 + 25y^4z^6)}$

B5 $9x^2 + 16y^2$ $\boxed{\text{DOES NOT FACTOR}^*}$ Sum of squares

B6 $9x^2 - 16y^2z^{14} =$ Difference of squares.

$= 3^2x^2 - 4^2y^2(z^7)^2$

$= (3x)^2 - (4yz^7)^2$

$= (3x - 4yz^7)(3x + 4yz^7)$

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#7 $x^2 - 4x + 1 = 0$ SLEDGEHAMMER
FIND ZEROS
REVERSE-ENGINEER

$x^2 - 4x = -1$

$x^2 - 4x + 2^2 = -1 + 4$

$(x-2)^2 = 3$

$x - 2 = \pm\sqrt{3}$

$x = 2 \pm \sqrt{3}$ $\Rightarrow$ $x^2 - 4x + 1 = (x - (2+\sqrt{3}))(x - (2-\sqrt{3}))$

*#5 You can make #5 factor by force:

$9x^2 + 16y^2 = 9x^2 - (-1 \cdot 16y^2)$

$= 9x^2 - (i^2 \cdot 16y^2)$

$= 3^2x^2 - 4^2y^2i^2$

$= (3x)^2 - (4iy)^2$

$= (3x - 4iy)(3x + 4iy)$!

But you need complex #s to do it!