NAME KEY

MIDTERM 1 – MATH 240 – SPRING 2014 – PROFESSOR FULLER

You must show work on all problems to receive credit.

1. Factor completely. $y^4 - 81$

$y^4 - 81 = (y^2)^2 - 9^2 = (y^2+9)(y^2-9)$
$= (y^2+9)(y^2-3^2)$
$= \boxed{(y^2+9)(y+3)(y-3)}$ ✓

2. Factor completely. $6x^2 - 15x - 9$

$6x^2 - 15x - 9$
$= 3(2x^2 - 5x - 3)$
$= \boxed{3(x-3)(2x+1)}$ ✓

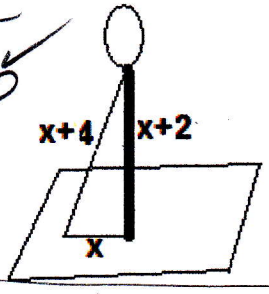
$2x^2 - 5x - 3$
$2x^2 + (x + x - 3)$
$(2x^2 + 6x) + (x - 3)$
$2x(x-3) + (x-3)$
$(x-3)(2x+1)$

$2(-3) = -6$
$1(-6) = -6$ $1 + (-6) = -5$

3. I have put a guy wire on one of the crape myrtle trees in my back yard to help it grow straight. The location of the stake and where the wire attaches to the tree are given in the illustration. How long is the guy wire.? **Make a concluding statement.** If you need more room, you may use the back side of this sheet.

$x^2 + (x+2)^2 = (x+4)^2$
$x^2 + x^2 + 4x + 4 = x^2 + 8x + 16$
$x^2 + 4x + 4 - 8x - 16 = 0$
$x^2 - 4x - 12 = 0$
$(x-6)(x+2) = 0$
$x - 6 = 0$ or $x + 2 = 0$
$x = 6$ $x = -2$

Length of wire
$x + 4 = 6 + 4 = 10$ ✓



The length of the guy wire is 10 UNITS ✓

4. A model rocket will be launched from sea level at the ocean's edge, and the rocket will fall into the ocean. The rocket's distance, s, above sea level at any time, t, is found by the equation $s(t) = -16t^2 + 64t$. How much time will it take for the rocket to strike the ocean. **Make a concluding statement.**

$s(t) = -16t^2 + 64t$

$0 = -16t^2 + 64t$

$0 = 16t^2 - 64t$

$0 = 16t(t-4)$

$\frac{0}{16} = \frac{16t(t-4)}{16}$

$0 = t(t-4)$

$t = 0$ or $t - 4 = 0$

$t = 0$ $\quad$ $t = 4$ ✓

The rocket will strike the ocean at 4 UNITS ✓

5. Simplify the rational expression. $\frac{x^2 - 14x + 49}{x^2 - 49}$

$\frac{x^2 - 14x + 49}{x^2 - 49} = \frac{(x-7)(x-7)}{(x+7)(x-7)} = \boxed{\frac{x-7}{x+7}}$ ✓

6. Multiply the rational expressions. $\frac{9y+21}{y^2-2y} \bullet \frac{y-2}{3y+7}$

$\frac{9y+21}{y^2-2y} \cdot \frac{y-2}{3y+7} = \frac{3(3y+7)}{y(y-2)} \cdot \frac{(y-2)}{(3y+7)} = \boxed{\frac{3}{y}}$ ✓

7. Subtract the rational expressions. $\dfrac{3x+7}{x^2-5x+6}-\dfrac{3}{x-3}$

$x^2-5x+6=(x-2)(x-3)$

$x-3=(x-3)$

$LCD=(x-2)(x-3)$

$$\frac{3x+7}{(x-2)(x-3)}-\frac{3(x-2)}{(x-3)(x-2)}$$

$$=\frac{3x+7-3(x-2)}{(x-2)(x-3)}$$

$$=\frac{3x+7-3x+6}{(x-2)(x-3)}$$

$$\frac{13}{(x-2)(x-3)} \text{ or } \frac{13}{x^2-5x+6}$$

8. Simplify the complex rational expression. $\dfrac{\frac{3}{x}+\frac{x}{3}}{\frac{x}{3}-\frac{3}{x}}$

$$\frac{\frac{3}{x}+\frac{x}{3}}{\frac{x}{3}-\frac{3}{x}}=\frac{\frac{3(3)}{x(3)}+\frac{x(x)}{3(x)}}{\frac{x(x)}{3(x)}-\frac{3(3)}{x(3)}}=\frac{\frac{9+x^2}{3x}}{\frac{x^2-9}{3x}}=$$

$$\frac{9+x^2}{3x}\cdot\frac{3x}{x^2-9}=\frac{9+x^2}{x^2-9} \text{ or } \frac{9+x^2}{(x+3)(x-3)}$$

9. Solve the rational equation. $\frac{7}{x+1}=\frac{5}{x-3}$

LCD $=(x+1)(x-3)$

$\frac{7}{x+1}=\frac{5}{x-3}$

$(x+1)(x-3)\frac{7}{(x+1)}=(x+1)(x-3)\frac{5}{(x-3)}$

$(x-3)7=(x+1)5$

$7x-21=5x+5$

$7x-21-5x=5x+5-5x$

$2x-21=5$

$2x=26$

$\frac{2x}{2}=\frac{26}{2}$

$x=13$ ✓

10. The redwood tree in my back yard casts a shadow 27 feet long. At the same time, a vertical rod 5 feet long casts a shadow 3 feet long. How tall is my redwood tree? **Make a concluding statement.**

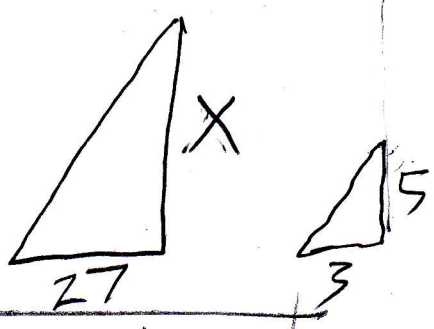
$\frac{x}{27}=\frac{5}{3}$

$3x=5(27)$

$\frac{3x}{3}=\frac{5(27)^9}{3}$

$x=5(9)$

$x=45$ ft



The redwood tree is 45 ft. tall ✓