8/27/2010 Fall 10, College Algebra I Quiz 1 Sitaraman
Math 006-19 Howard University Mathematics Dept

Instructions:
PLEASE PROVIDE STEP BY STEP EXPLANATIONS
WRITING ONLY ANSWERS WILL NOT GET FULL CREDIT
Time Limit 30 minutes
Please read the questions carefully before answering
Each problem 5 points unless otherwise stated.
Any points you get in excess of 30 is extra credit.

1.(10 points) Simplify the following: (a) $\frac{6^{24}}{3^{-15}2^{-15}}$ (b) $\frac{3}{10} + \frac{7}{24}$ (MUST USE LCM OF DENOMINATORS)

Soln: (a) You can combine the powers in the denominator because they have same exponent. Doing that, we get $\frac{6^{24}}{3^{-15}2^{-15}} = \frac{6^{24}}{(3*2)^{-15}} = \frac{6^{24}}{6^{-15}} = 6^{24-(-15)} = 6^{39}$ (b) LCM of 10 and 24 is 120. This is the COMMON DENOMINATOR. Converting both to common denominator, we get $\frac{3}{10} + \frac{7}{24} = \frac{3\times12}{10\times12} + \frac{7\times5}{24\times5} = \frac{36}{120} + \frac{35}{120} = \frac{36+35}{120} = 71/120$.

2.(10 points) Simplify: $\frac{x^3(y^2z)^{-2}}{x^2z^3}$ and write your answer with positive exponents.

Soln: $\frac{x^3(y^2z)^{-2}}{x^2z^3} = \frac{x^3(y^2)^{-2}z^{-2}}{x^2z^3} = x^{3-2}y^{2(-2)}z^{-2-3} = xy^{-4}z^{-5}$
$= \frac{x}{y^4z^5}$

3.Simplify by multiplying term by term: $(x^2+2x+2^2)\times(x-2)$. (Bonus 5 points) Can you identify a pattern?

Soln: $(x^2+2x+2^2)(x-2) = x^2(x-2)+2x(x-2)+2^2(x-2) = x^3-2x^2+2x^2-4x+4x-2^3 = x^3-2^3$ (after cancellations). The pattern is expressed by the following formula: $(A^2+AB+B^2)(A-B) = A^3-B^3$. In other words, this shows how a difference of cubes splits into a product of two expresssions.

4. Find the speed of a bike (in feet per second) if the radius of the wheel is 1 foot and it is making 20 revolutions per second. Multiply this speed by 3600/5280 to get the speed in miles per hour (1 mile = 5280 feet).[Hint: Speed = rpm times circumference].

Soln: Speed of the bike is $(rps) \times (circumference) = 20 \times (2\pi r) = 20(2\pi(1)) = 40\pi = 125.66$ feet per second approximately. This is 85.68 mph (equals 125.66 times 3600/5280). (Yes, bikes can go that fast! In fact, racing bikes can easily go above 50 mph. They can reach 80 mph going downhill).