MA100 Homework Set #1 (30 Points)
Fall 2006
Issued: 17 August 2006

DUE: 23 August 2006
Expected time to complete: 1hour

GENERAL

1. This is an **INDIVIDUAL** graded homework set.
2. Follow the Department of Mathematical Sciences' policy on reporting numerical answers.
3. Submit all supporting calculations and analysis. You will not receive credit for work that is not supported! When technology is used, include a printout or appropriate description of your procedure. Ensure all supporting work is logical, neat, organized and legible.
4. This problem set is due on **23 August 2006**, at the beginning of class.
5. This is a **graded homework assignment** worth 30 points. Include a cover sheet and document any assistance you receive in accordance with *Documentation of Written Work*, August 2004.

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1. Suppose you are buying coke and pizza for your pre-calculus study group. A six pack of Cokes costs \$3.00 and a large pizza cost \$8.00. If x denotes the number of six packs of coke and y is number of pizza, then the total amount of coke and pizza that you can purchase with 32 dollars must satisfy the inequality

$$3x + 8y \le 32$$

Use this inequality to answer the following questions.

a. (5 points) Can you purchase 3 six packs of coke and 3 pizzas with the money that you have?

$3x + 8y \le 32$
$= 3 \cdot 3 + 8 \cdot 3 \overset{?}{\le} 32$
$= 9 + 24$
$= 33 > 32$

33 is not ≤ 32, so no you can not purchase 3 six packs of coke and 3 pizzas with 32 dollars.

b. (5 points) If you know you need 2 six packs of cokes, how many pizzas does that allow you to purchase?

$3x + 8y \le 32$
$3 \cdot 2 + 8y \le 32$
$6 + 8y \le 32$
$-6 \quad -6$
$8y \le 26$
$y \le 26/8$
$y \le 3.25$

You can purchase 3.25 pizzas if you have 32\$ and you buy 2 six packs of cokes. Realistically though you can't purchase less than a whole pizza (not counting pizza by the slice) so you can purchase 3 pizzas.

2. The speed of water in a river bed can be modeled with the following formula,

$V = 1.486\dfrac{17.78(\sqrt{s})}{25^{\frac{2}{3}}(n)}$, where V is the velocity of the flow in ft/s, s is the slope of the channel and n is the roughness coefficient.

a. (5 points) Given that a specific canal has slope of .250 and a roughness coefficient of .040 what is the velocity of the river flow.

$$V = 1.486\left(\frac{17.78(\sqrt{5})}{25^{2/3}(n)}\right) = 1.486\left(\frac{17.78(\sqrt{.25})}{\sqrt[3]{25^2}(.040)}\right) = 1.486\left(\frac{17.78(.5)}{\sqrt[3]{625}(.040)}\right)$$

$$= 1.486\left(\frac{8.89}{(8.549)(.040)}\right) = 1.486\left(\frac{8.89}{3.42}\right) = 1.486(25.99) = 38.63$$

The velocity of the river flow is 38.63 ft/sec.

b. (5 points) Given that a specific canal has a water speed of 50 ft/s and a roughness coefficient of .040, what is the slope of the channel?

$$50 = 1.486\left(\frac{17.78(\sqrt{5})}{25^{2/3}(.040)}\right)$$

$$\left(\frac{1}{1.486}\right)50 = \left(\frac{1}{1.486}\right)1.486\left(\frac{17.78\sqrt{5}}{3.42}\right)$$ → from above

$$33.647 = 5.199\sqrt{5}$$

$$\left(\frac{1}{5.199}\right)33.647 = \left(\frac{1}{5.199}\right)(5.199)\sqrt{5}$$

$$6.472 = \sqrt{5}$$

$$(6.472)^2 = (\sqrt{5})^2$$

$$41.88 = 5$$

The slope of the channel is 41.88.

3. (5 points) Show that:

a. $(t+3)(2t-1) - 3(t+2) = 2t^2 + 2t - 9$.

$2t^2 - t + 6t - 3 - 3t - 6$

$2t^2 - t + 6t - 3t - 3 - 6$

$2t^2 - 4t + 6t - 9$

$2t^2 + 2t - 9 = 2t^2 + 2t - 9$ ✓

4. (5 points)

a. Simplify $\dfrac{x^{\frac{1}{3}}y^{\frac{1}{3}}}{(xy)^{\frac{-2}{3}}} = \dfrac{x^{\frac{1}{3}}y^{\frac{1}{3}}}{x^{-2/3}y^{-2/3}} = x^{\frac{1}{3}-\frac{-2}{3}}y^{\frac{1}{3}-\frac{-2}{3}} = x^{\frac{3}{3}}y^{\frac{3}{3}} = xy$

ENDNOTES

[1.] CDT Justin Tyme, D-2, '10, assistance given to author, email, West Point, NY, 19 August 2006. I emailed my answers on problem 1 to CDT Tyme so that I could compare my answers to what he got. After reviewing the file, he said that although our answers to 1b were the same you realistically couldn't buy part of a pizza. I added that to my answer upon his recommendation.

[2.] CDT Aubrey Adams, E-1, '10, assistance given to author, review of work, West Point, NY, 19 August 2006. I showed CDT Adams my work on problem 2. She said that since we were looking for *s* that it had to be isolated on one side of the equation. I told her I didn't know how to isolate it so she showed me how to multiply by fractions to cancel out terms and said that what I do to one side of the equation I have to do to the other. She also showed me how to get rid of a square root. Lastly, I asked her what the unit of measurement was for slope and she told me that there wasn't one.

[3.] CDT John Joe, D-2, '10, assistance given to author, phone call, West Point, NY, 19 August 2006. I had no idea what to do on problem 4 so I called CDT Joe and asked him what he did. I copied what he told me that he did.

WORKS CITED

Tyme, Justin. Email. 19 August 2006

Adams, Aubrey. Discussion. 19 August 2006

Joe, John. Phone discussion. 19 August 2006.