MATH 112 QUIZ 10 APRIL 29, 2009

NAME:

Problem 1 (3 points):
Solve the following system of equations.

$$2x + 4y = 4$$
$$3x - 2y = 2$$

Solution: Multiplying the second equation by 2 gives us the system

$$2x + 4y = 4$$
$$6x - 4y = 4$$

Adding the second equation to the first gives a result of $8x = 8$ and so $x = 1$. Plugging this into either of the original two equations, we find that $y = \frac{1}{2}$.
Therefore, our solution is

$$\left(1, \frac{1}{2}\right)$$

Problem 2 (3 points): *Solve the following system of equations*

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

Solution: Multiplying the first equation by 2 gives the system

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

Adding the two equations together then gives $0 = 3$ which is a contradiction, so there is no solution.

Problem 3 (3 points): *Radon-226 is a naturally occuring radioactive gas with a half-life of 4 days. Find the equation which models its decay assuming you start with* 100 *grams.*

Solution: If we begin with 100 grams of radon-226, after 4 days we will have 50 grams left. The equation modeling this is

$$50 = 100e^{4k}$$

And so we have that

$$\frac{1}{2} = e^{4k}$$

Taking natural logarithms of both sides gives us

$$4k = \ln \frac{1}{2}$$

Dividing by both sides gives us a value for k and so the decay of radon-226 is modeled by the equation

$$N = 100e^{\frac{1}{4}\ln(1/2)}$$

Problem 4 (1 point): *Let a and b be positive real numbers. Saying that $a^2\sqrt{a^2b}$ is equal to $a^3b^{1/2}$ is (circle one):*

CORRECT *A VITAL ERROR*

Solution: The above operation is **CORRECT**. We can get this result by the following simplifications.

$$\begin{aligned} a\sqrt{a^2b} &= a^2\left(a^2b\right)^{1/2} \\ &= a^2\left(a^2\right)^{1/2}b^{1/2} \\ &= a^2ab^{1/2} \\ &= a^3b^{1/2} \end{aligned}$$