Math 103 Exam #3 Key (Summer II 2011)

1.

	Rate	Time	Distance
East	500	$\frac{x}{500}$	x
West	350	$\frac{x}{350}$	x

The round-trip time was 8.5 hours, so we obtain the equation $\frac{x}{500} + \frac{x}{350} = 8.5$. Multiplying both sides by 3,500 gives: $7x + 10x = 29,750 \Rightarrow 17x = 29,750 \Rightarrow x = 1,750$ miles.

2.

	Rate	Time	Distance
Jerry	$\frac{1}{20}$	12	$\frac{12}{20}$
Tom	$\frac{1}{t}$	12	$\frac{12}{t}$

Let t be the time it would take Tom to do the job working alone. We get $\frac{12}{20} + \frac{12}{t} = 1 \Rightarrow \frac{3}{5} + \frac{12}{t} = 1 \Rightarrow 3t + 60 = 5t \Rightarrow t = 30$ hours.

3a. The second equation gives $y = 3 - 2x$, which we substitute into the first equation to get $3x - 2(3 - 2x) = 7 \Rightarrow 3x - 6 + 4x = 7 \Rightarrow 7x = 13 \Rightarrow x = 13/7$. Putting this into either equation in the system yields $y = -5/7$. Solution is $\left(\frac{13}{7}, -\frac{5}{7}\right)$.

3b. The second equation gives $y = 5x$, which we substitute into the first equation to get $\frac{1}{4}x - \frac{1}{5}(5x) = 9 \Rightarrow 5x - 4(5x) = 180 \Rightarrow -15x = 180 \Rightarrow x = -12$. Putting this into either equation in the system yields $y = -60$. Solution is $(-12, -60)$.

4a. 9

4b. $|r|$

5a. $7^3 = 343$

5b. $1/81^{3/4} = 1/3^3 = 1/27$

6a. $r^{11/9}$

6b. $\dfrac{1}{m^{1/4}n^{3/4}}$

7a. $10\sqrt{3}$

7b. $11xy^2\sqrt{y}$

7c. $-2tz^2\sqrt[3]{3t^2z}$

7d. $\dfrac{u\sqrt{u}}{9}$

7e. $45\sqrt{2}$

8. $18 - 4\sqrt{15} + 3\sqrt{15} - 10 = 8 - \sqrt{15}$

9a. $\dfrac{2\sqrt{6}}{3}$

9b. $8 + 4\sqrt{3}$

10a. $\sqrt{4y-1} = 6 \Rightarrow 4y - 1 = 36 \Rightarrow y = 37/4$

10b. $7z + 1 = z^2 + 2z + 1 \Rightarrow z^2 - 5z = 0 \Rightarrow z = 0, 5$

11a. $4 + 5i$

11b. $27 + 12i$

11c. $\frac{1}{2} - \frac{3}{2}i$

12a. $x^2 + x - 14 = 0 \Rightarrow x = \dfrac{-1 \pm \sqrt{57}}{2}$

12b. $x = \dfrac{-4 \pm \sqrt{-20}}{2} = -2 \pm i\sqrt{5}$