Math 1030 **Workshop #3** **Due: July 18^{th}, 2013**

Name: ______________________________

1. Frank builds modular homes. After extensive research he has collected the following data:

Houses Built	1	10	70	150	15	90	145
Demand Price	$250,000	$175,000	$135,000	$115,000			
Supply Price					$75,000	$125,000	$180,000

For example, if Frank charges $175,000 for his modular homes, he can expect to sell about 10. Also, if he is willing to pay an average of $125,000 per house, he can get 90 built.

(a) Use the table of data to find supply and demand price functions. Use a **power** model for the demand function and an **exponential** model for the supply function.

Demand function: $p_d =$ ______________________________

Supply function: $p_s =$ ______________________________

The market equilibrium is $(q_E, p_E) = \Big($ ______________ , ______________ $\Big)$.
[Round the quantity to 3 decimal places and the price to dollars and change.]

If Frank charges $130,000 per house, how many can he expect to sell? ____________
[Round to 3 decimal places.]

If Frank builds 100 houses, what will his (average supply) cost per house be? $____________

(b) Use your model for the demand function to find a revenue function. Use your supply function to model the variable cost per house and the fact that Frank has fixed costs of $65,000 to find his cost function. Finally, use your revenue and cost functions to find profit, marginal revenue, marginal cost, and marginal profit functions.

Frank has _____ break even points. These occur at $q =$ ____________________ houses.
[Round all break even quantities to 3 decimal places.]

Frank's 35^{th} house brings in $______________ revenue.

The 35^{th} house costs him $______________ to build.

Frank maximizes his profit when he sells __________ houses.

Frank needs to sell each house for $________________ to maximize his profit.

His maximum possible profit is $____________________.

(c) Does Frank's cost function have a minimum? In a few sentences explain why or why not.

2. Use Excel to compute the following limits. If the limit does not exist write "DNE".

(a) SKIP ME $\lim_{x \to -4} \frac{e^{-x}}{\ln(x^2 - 16)} =$ SKIP THIS PART

(b) $\lim_{x \to 5} \frac{1}{(x-5)^3} =$ ____________________

3. Recall that the **derivative** of $f(x)$ is defined to be

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

where $\frac{f(x+h) - f(x)}{h}$ is called the **difference quotient** of $f(x)$.

Let $f(x) = 3 - (x-2)^2 + 2|x-2|$.

(a) Compute the difference quotient of $f(x)$ when $x = 1.5$ and $h = 0.25$. [*Note:* "$|x-2|$" refers to the absolute value of $x - 2$. In Excel, "=ABS(A1)" would compute the absolute value of the number in cell A1.]

$\frac{f(1.5 + 0.25) - f(1.5)}{0.25} =$ ____________________

Now use Excel to compute the limit as $h \to 0$. This shows that $f'(1.5) \approx$ ________________.

(b) Use Excel to repeat the previous part for $x = 2$ (compute $f'(2)$). Does the limit ($h \to 0$) of the difference quotient at $x = 2$ exist? If it does exist, what is it? If it does not exist, why not? Explain your answer in a sentence or two.