Name: Date: Period:

Function Notation:
Best to use a letter related to the problem.

For example: If problem talks about the cost of something, use c(x) for the function.

$$c(x) = \begin{cases} \text{Equation \#1*} \\ \text{Equation \#2**} \end{cases}$$

Curly Bracket

Intervals:
These provide domain restrictions
Use Inequality Signs
Usually start with $0 \le x \le \#$ (not always)

if _____

if _____

These **boundaries** determine open circle or closed circle on the graph.

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*Equation #1: Use the information given.

Either:

1. Find the slope (you may have to use the slope formula and substitute 2 points).
2. Find the y-intercept.
3. Use y = mx + b

OR:

1. If there is a situation described in the word problem, convert the situation into y = mx + b format.

**Equation #2:

To write Equation #2, you **MUST** take into consideration what happened **first**. In order to get to the second interval, you HAD to **complete** the first interval. If there are more than 2 equations, you must ALWAYS use the previous equation to start the next PIECE.

1: Substitute the maximum boundary from the previous equation to find the starting point.

2: Multiply the "additional charge" by ("x" minus "# from previous boundary"). Remember: You are only being charged this amount for anything **OVER** the initial boundary, so you must subtract.

Example:

An Internet Service Provider has the following rate schedule for high-speed internet service:

Monthly Service Charge - $18.00

First 50 Hours of Usage – Free
Next 50 hours of Usage - $0.25/hour
Over 100 hours of Usage - $1.00/hour

To get to the 2nd interval, you must max out the first interval.

The new rate of $.25 ONLY applies to hours between 50 &100

$$f(x) = \begin{cases} 18 & 0 \le x \le 50 \\ 18 + 0.25\,(x - 50) & 50 < x \le 100 \\ 30.50 + 1.00\,(x - 100) & x > 100 \end{cases}$$

To get to the 3rd interval, you must max out the second interval. Substitute 100 (max from interval) for x, you get $30.50.

The new rate only applies to hours over 100

1. You have a summer job that pays time and a half for overtime. That is, if you work more than 40 hours per week, your hourly wage for the extra hours is 1.5 times your normal hourly wage of $7. Write a piecewise function that gives your weekly pay P in terms of the number h of hours you work. How much will you get paid if you work 45 hours?

Non-Simplified

$$P(h) = \begin{cases} 7h & \text{if } 0 < h \le 40 \\ 280 + 10.5(h - 40) & \text{if } h > 40 \end{cases}$$

Max out the first interval to **start** the second equation. Substitute 40 (max from interval) for x, you get $280.

The new rate of $10.50 (7 x 1.5) ONLY applies to hours OVER 40

OR

Simplified

$$h(t) = \begin{cases} 7h & \text{if } 0 < h \le 40 \\ 10.5h - 140 & \text{if } h > 40 \end{cases}$$

These are the same equations, just simplified

If you work 45 hours, you substitute 45 into second equations since 45 > 40. So, 280 + 10.5(45 – 40) = 280 + 10.5(5) = 332.50. You will earn $332.50 if you work 45 hours.

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2. You plan to sell **I Love Math** t-shirts as a fundraiser. The wholesale t-shirt company charges you $10 a shirt for the first 75 shirts. After the first 75 shirts you purchase up to 150 shirts, the company will lower its price to $7.50 per shirt. After you purchase 150 shirts, the price will decrease to $5 per shirt. Write a function that models this situation.

Max out the first interval to **start** the second equation. Substitute 75 (max from interval) for x, you get $750.

The new rate of $7.50 ONLY applies to shirts OVER 75

Non-Simplified

$$f(x) = \begin{cases} 10x & \text{if } 0 < x \le 75 \\ 750 + 7.5(x - 75) & \text{if } 75 < x \le 150 \\ 1312.50 + 5(x - 150) & \text{if } x > 150 \end{cases}$$

Max out the first interval to **start** the second equation. Substitute 150 (max from interval) for x, you get $1312.50, which is what you must pay before you get the **NEW** rate

The **NEW** new rate of $5 ONLY applies to shirts OVER 150

OR

Simplified

$$f(x) = \begin{cases} 10x & \text{if } 0 < x \le 75 \\ 187.50 + 7.5x & \text{if } 75 < x \le 150 \\ 562.50 + 5x & \text{if } x > 150 \end{cases}$$

These are the same equations, just simplified

Try these:

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3. Southeast Electric charges $0.09 per kilowatt-hour for the first 200 kWh. The company charges $0.11 per kilowatt-hour for all electrical usage in excess of 200 kWh.

   [a] Write a non-simplified piecewise function and a simplified function.

   [b] How many kilowatt-hours were used if a monthly electric bill was $57.05?

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4. A construction worker earned $17 per hour for the first 40 hours of work and $25.50 per hour for work in excess of 40 hours.

   [a] Write a non-simplified piecewise function and a simplified function.

   [b] One week he earned $896.75. How much overtime did he work?