Homework Review

By = 3x + 6
-3x - 3x
-3x + by = 6
3x - by = -6

Ax + By = C

y = mx + b

y - y_1 = m(x - x_1)

y = 2

x

y
Piecing Together Piecewise Functions - Guided Discovery Activity

1) Given the following linear equations, represent solutions graphically on two separate coordinate planes.

\[ y = 3x \]

\[ y = -2x + 4 \]
2) Using the coordinate plane below, place a piece of transparent paper on top and graph the solution of the first equation according to the given domain.

\[ y = 3x \quad \text{where} \quad -1 \leq x < 4 \]

Now place a second piece of transparent paper on top and using a different colored pencil, graph the solution of the second equation according to the given domain.

\[ y = -2x + 4 \quad \text{where} \quad 4 \leq x \leq 6 \]
3) What are some similarities and differences between your first two graphs and the third one with the transparencies?
Think about: Is a piecewise function continuous?

Written in functional notation, number two would look like the following:

\[ f(x) = \begin{cases} 
3x & -1 \leq x < 4 \\
-2x + 20 & 4 \leq x \leq 6 
\end{cases} \]

4) This is known as a piecewise function. Using the third graph and the discussion we just had, write your own definition for a piecewise function.
Piecewise Functions (2.7)

Piecewise Functions: functions represented by at least 2 equations that correspond to different domains.

Evaluating Piecewise Functions:
1. Choose which equation to use based on the x value, the domain.
2. Evaluate following order of operations.

Ex 1 Evaluate the function for the following values of x.

\[ f(x) = \begin{cases} 
3x + 2, & -2 \leq x \leq 0 \\
0, & 0 < x \leq 4 
\end{cases} \]

a) \[ f(0) = \frac{3(0) + 2}{3(0) + 2} = 2 \]

b) \[ f(3) = \frac{3 - 1}{3 - 1} = 2 \]

c) \[ x = 6 \] no soln.
Graphing Piecewise Functions:

1. Divide the function into parts of the domain by making vertical asymptotes (dotted vertical lines) at changing points.

2. Plug in the change-values into all equations to determine the ordered pairs of end-points on the vertical asymptotes. Use open or closed circles for those end-points appropriately.

3. Graph each equation in its domain part only. (Use slope to help!)

Ex 2 Graph.

\[ m(x) = \begin{cases} \frac{2}{3}x - 2, & x \leq 3 \\ -x + 1, & x > 3 \end{cases} \]

1. \( m(3) = \frac{2}{3}(3) - 2 = 2 - 2 = 0 \)
   \( (3, 0) \)

2. \( m(3) = -3 + 1 = -3 + 1 = -2 \)
   \( (3, -2) \)
Ex 3 Graph.

\[ y = 1 \text{ horiz.} \]

\[ g(x) = \begin{cases} 
1, & \text{if } -4 \leq x < -2 \\
2, & \text{if } -2 \leq x < 0 \\
3, & \text{if } 0 \leq x < 2 \\
4, & \text{if } 2 \leq x < 4 
\end{cases} \]

1. \( g(x) = 1 \)
2. \( g(x) = 2 \)
3. \( g(x) = 3 \)
4. \( g(x) = 4 \)
Ex 4  Shipping costs $6 on purchases up to $50, $8 on purchases over $50 and up to $100, and $10 on purchases over $100 and up to $200. Write and graph a function for the cost of shipping.

\[ f(x) = \begin{cases} 
  x + 6 & \text{if } 0 < x \leq 50 \\
  x + 8 & \text{if } 50 < x \leq 100 \\
  x + 10 & \text{if } 100 < x \leq 200 \\
  x + 12 & \text{if } x > 200
\end{cases} \]

1. \( f(x) = x + 6 \)
   \( f(0) = 0 + 6 = 6 \)
   \( (0, 6) \)

2. \( f(x) = x + 8 \)
   \( f(50) = 50 + 8 = 56 \)
   \( (50, 56) \)

3. \( f(x) = x + 10 \)
   \( f(100) = 100 + 10 = 110 \)
   \( (100, 110) \)

4. \( f(x) = x + 12 \)
   \( f(200) = 200 + 12 = 212 \)
   \( (200, 212) \)
Group Work

1) Take a look at your company's shipping information. Your task is to write a piecewise function for the total cost (cost of order + cost of shipping) for whatever you might purchase. Your domain should be defined by the intervals of the merchandise amount.

Hint:
Total cost \( T(x) = \) cost of order (use \( x \)) + cost of shipping (refer to chart)
\[ T(x) = x + \underline{\text{_______}} \quad \text{Domain: } ? < x \leq ? \]

2) Once you have written your piecewise function, make sure Mrs. Kenny checks and approves it.

3) Then, graph your piecewise function on a coordinate plane. You may need to count by larger intervals (ex. count by 10's) in order to fit your function on the graph. Think about if you need all four quadrants of the coordinate plane.

4) When finished, write a piecewise function for the final word problem.
<table>
<thead>
<tr>
<th>Order Total</th>
<th>Standard (7-10 business days)</th>
<th>Express (3-5 business days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to $30.00</td>
<td>$6.95</td>
<td>$14.95</td>
</tr>
<tr>
<td>$30.01 to $60.00</td>
<td>$8.95</td>
<td>$16.95</td>
</tr>
<tr>
<td>$60.01 to $90.00</td>
<td>$10.95</td>
<td>$18.95</td>
</tr>
</tbody>
</table>

\[ T(x) = \begin{cases} 
  x + 6.95 & \text{if } 0 \leq x < 30 \\
  x + 8.95 & \text{if } 30 \leq x < 60 \\
  x + 10.95 & \text{if } 60 \leq x \leq 90 
\end{cases} \]

\[ T = \text{total cost} \]

\[ x = \text{sales cost} \]
Step 1: Write a piecewise function for shipping.

Step 2: Get your function approved by Mrs. Kenny.

Step 3: Graph your piecewise function (each part in different colors). Label each part of your graph.

Step 4: Final Word Problem

Suppose you plan to buy many blank compact disks. You check price lists and find out that if you buy 100 CDs or fewer you pay $0.74 each. However if you buy between 100 and 300 CDs the price drops to $0.69 each for the second hundred. Write a function that describes the cost $c$ of $n$ number of CDs purchased.
# Shipping & Delivery

**Standard Shipping:**
For Pier 1 To-You online orders, standard shipping charges are based on the order total and will be calculated and viewable at checkout.

<table>
<thead>
<tr>
<th>Order Total</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to $15</td>
<td>$4.95</td>
</tr>
<tr>
<td>$15.01 - $25.00</td>
<td>$6.95</td>
</tr>
<tr>
<td>$25.01 - $35.00</td>
<td>$7.95</td>
</tr>
<tr>
<td>$35.01 - $50.00</td>
<td>$10.95</td>
</tr>
<tr>
<td>$50.01 - $75.00</td>
<td>$11.95</td>
</tr>
<tr>
<td>$75.01 - $100.00</td>
<td>$14.95</td>
</tr>
<tr>
<td>$100.01 - $125.00</td>
<td>$16.95</td>
</tr>
<tr>
<td>$125.01 - $150.00</td>
<td>$18.95</td>
</tr>
<tr>
<td>$150.01 - $200.00</td>
<td>$21.95</td>
</tr>
<tr>
<td>$200.01 - $250.00</td>
<td>$25.95</td>
</tr>
<tr>
<td>$250.01 - $300.00</td>
<td>$29.95</td>
</tr>
<tr>
<td>$300.01 - $400.00</td>
<td>$39.95</td>
</tr>
<tr>
<td>$400.01 and above</td>
<td>10%</td>
</tr>
</tbody>
</table>

Stop here at $100

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**Step 1:** Write a piecewise function for shipping.

**Step 2:** Get your function approved by Mrs. Kenny.

**Step 3:** Graph your piecewise function (each part in different colors). Label each part of your graph.

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**Step 4: Final Word Problem**

Suppose you plan to buy many blank compact disks. You check price lists and find out that if you buy 100 CDs or fewer you pay $0.74 each. However, if you buy between 100 and 300 CDs the price drops to $0.69 each for the second hundred. Write a function that describes the cost $c$ of $n$ number of CDs purchased.
Step 1: Write a piecewise function for shipping.

Step 2: Get your function approved by Mrs. Kenny.

Step 3: Graph your piecewise function (each part in different colors). Label each part of your graph.

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Suppose you plan to buy many blank compact disks. You check price lists and find out that if you buy 100 CDs or fewer you pay $0.74 each. However if you buy between 100 and 300 CDs the price drops to $0.69 each for the second hundred. Write a function that describes the cost $c$ of $n$ number of CDs purchased.
### Prints & Enlargements from Online Photos

<table>
<thead>
<tr>
<th>Prints and Enlargements</th>
<th>Price (each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x6 print(s)</td>
<td>9¢</td>
</tr>
<tr>
<td>4x6 collage print(s)</td>
<td>15¢</td>
</tr>
<tr>
<td>4x6 framed collage prints</td>
<td>$16.99</td>
</tr>
<tr>
<td>5x7 print(s)</td>
<td></td>
</tr>
</tbody>
</table>

- **1-10 prints**: 79¢
- **11-24 prints**: 69¢
- **25-49 prints**: 65¢
- **50+ prints**: 59¢

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**Step 1**: Write a piecewise function for shipping.

**Step 2**: Get your function approved by Mrs. Kenny.

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**Step 4: Final Word Problem**

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Suppose you plan to buy many blank compact disks. You check price lists and find out that if you buy 100 CDs or fewer you pay $0.74 each. However if you buy between 100 and 300 CDs the price drops to $0.69 each for the second hundred. Write a function that describes the cost $c$ of $n$ number of CDs purchased.
Mini-Project

Algebra 2
Mini-Project – Piecewise Functions

Name: ________________________________

Create your own piecewise function!

• You need at least 3 equations but you can have up to 5.
• Graph your function neatly on graph paper. Make each piece a different color. Be careful with open and closed circles. Attach your graph to this sheet.
• Write your function algebraically, including your domains (below). Write each equation with the corresponding color from your graph. Be careful with < > versus ≤ ≥.
• Your equations should be linear (y = mx + b).
• Include at least one horizontal line. (Think about the equation for a horizontal line.)
• You need at least one positive and one negative slope.
• Be sure to set your domains accurately and in order (least to greatest).