Activity 1.2 – Linear Functions

1. (a) \( y - 5 = 2(x - 4) \) or \( f(x) - 5 = 2(x - 4) \)
   
   (b) \( y = 2x - 3 \) or \( f(x) = 2x - 3 \)
   
   (c) \( x = 3/2 \)

2. (a) Between 1915 and 1920, the population changed by \( 3100 - 3250 = -150 \) people, and
    
    changed at a rate of \( \frac{3100 - 3250}{1920 - 1915} = -30 \) people per year. The negative answers represent
    
    a decrease in population.
    
    (b) \( P(t) = -30t + 3250 \) people, where \( t \) is years after 1915.
    
    (c) \( P(10) = -30(10) + 3250 = 2950 \) people at the end of 1925.

3. (a) 

<table>
<thead>
<tr>
<th>Time ( t )</th>
<th>Position ( s )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-15</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>3</td>
<td>105</td>
</tr>
<tr>
<td>4</td>
<td>145</td>
</tr>
</tbody>
</table>

   (b) \( y = s(t) = 40t - 15 \) miles from Bill’s house.
   
   (c) Set \( 40t - 15 = 0 \) to get \( 40t = 15 \), or \( t = 15/40 = 0.375 \). This is the time at which the
    
    position from Bill’s house is zero. That is, they pass Bill’s house after 0.375 hours.
    
   (d) Since \( s(0) = -15 \), we can conclude that the initial position was 15 miles west of Bill’s.
    
   (e) \( s'(t) = 40 \) miles per hour (eastward)

4. (a) \( y = s(t) = 40t + C \) miles from Bill’s house
   
   (b) \( s'(t) = 40 \) miles per hour (eastward)
   
   (c) Infinitely many, since any line of the form \( 40t + C \) has a slope of 40. Examples include
    
   \( 40t - 10, 40t, \) and \( 40t + 3 \). The differences between these lines are their \( y \)-intercepts.
   
   (d) Since the distance traveled at the start of the trip is zero, the constant \( C = 0 \). Therefore,
    
   \( s(t) = 40t \) miles traveled.