Velocity-time graph problems

On the graph below, indicate when the object is accelerating, decelerating and maintaining a constant velocity.

**Velocity-time graph**

*Question:* Consider the motion of the object whose velocity-time graph is given in the diagram.

1. What is the acceleration of the object between times $t = 0$ and $t = 2$?
2. What is the acceleration of the object between times $t = 10$ and $t = 12$?
3. What is the net displacement of the object between times $t = 0$ and $t = 2$?
4. What is the net displacement of the object between times $t = 0$ and $t = 8$?
5. Describe the object's entire motion.
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Answers

1. acceleration = gradient \( \frac{\text{rise}}{\text{run}} = \frac{8}{2} = 4 \text{ms}^{-2} \)

2. acceleration = gradient \( \frac{\text{rise}}{\text{run}} = \frac{-4}{2} = -2 \text{ms}^{-2} \)

3. displacement = area \( \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 2 \times 8 = 8 \text{m} \)

4. Add the area between \( t = 2 \) and \( t = 8 \) to the area from question 3. 
   
   displacement = total area = \( 6 \times 8 + 8 = 56 \text{m} \)

5. The object accelerated between \( t=0 \) and \( t=2 \) up to 8m/s. It maintained a constant speed for 8 seconds before decelerating to 4m/s over 2 seconds. It maintained a speed of 4m/s for 4 seconds.