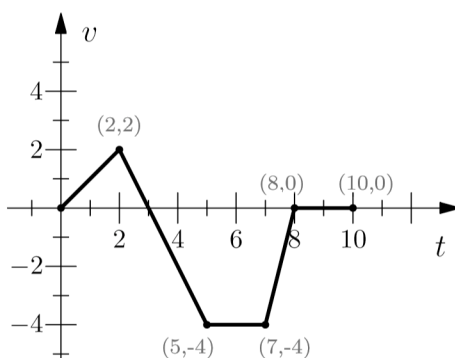


On the front of your bluebook, please write: a grading key, your name, student ID, and section and instructor. This exam is worth 100 points and has 6 questions. Notice, that there are 11-possible points available, so it is possible to earn up to 10 extra credit points. **Show all work!** Answers with no justification will receive no points. Please begin each problem on a new page. **No Calculators. No Notes.**

1. (20 points) The graph below shows the velocity  $v = ds/dt$  (m/sec) of a particle moving along a coordinate line over the time interval  $0 \leq t \leq 10$  seconds.
- When is the particle moving forward?
  - When is the particle moving backward?
  - When is the particle speeding up?
  - When is the particle's acceleration positive?
  - When does the particle move at its greatest speed?



2. (15 points) For a function  $f(x)$ :
- Write down the formal definition for  $f(x)$  to be **continuous** at a point  $c$  on its domain.
  - Write down the formal definition for the **derivative** of  $f(x)$ . (Either the definition from the text or the "alternative formula" from the homework is acceptable.)
3. (20 points) Let  $g(t) = \sqrt{2t-1}$ .
- Using the formal *definition* find the derivative of  $g(t)$ .
  - What is the slope of the line tangent to the curve  $g(t)$  when  $t = 5$ ?
  - Write down an equation for the line tangent to the curve  $g(t)$  when  $t = 5$ .
4. (35 points) Find the derivative of each of the following functions using any of the methods we have learned.
- $f(x) = 6x^2 - 10x - 5x^{-2} + \frac{1}{2-x} - \frac{3}{5-x^2}$
  - $r(\theta) = \theta \sin \theta + \cos \theta$
  - $y = \sec(x/2) \tan(x^2)$
  - $g(t) = (5-2t)^{-3} + \frac{1}{8}(\frac{2}{t} + 1)^4$
  - $y = 4 \sin(\sqrt{1+\sqrt{x}})$
5. (10 points) Evaluate the each of the following limits.
- $\lim_{t \rightarrow 0} \frac{6 \sin t}{t}$
  - $\lim_{t \rightarrow 0} \frac{2t}{\tan t}$

6. (10 points) Answer the following questions based on the graph below which shows a function  $f(x)$  with domain  $0 \leq x \leq 10$ .

- (a) For which three points on its domain is  $f(x)$  discontinuous?
- (b) For each of the points you found in part (a) state WHY the function is discontinuous by saying which part of the definition of continuity is not satisfied.

