MAC 2311: Worksheet June 19, 2017 **Group nr:** ____________

Problem 1. A stone is thrown straight upwards from the ground. Its height (in feet) above the ground t seconds after it is thrown is given by $s(t) = -16t^2 + 96t$.

(a) When does the stone land back on the ground?

(b) Compute the average velocity of the stone during the first two seconds.

(c) Compute the instantaneous velocity of the stone at $t = 2$ s.

(d) Sketch the graph of the function $s(t) = -16t^2 + 96t$ and explain how your answers from parts (b) and (c) are related to this graph.

Problem 2. (adapted from Exercise 3, section 2.1 textbook) The accompanying figure shows the position versus time for a certain particle moving along a straight line. Estimate each of the following from the graph.

(a) the average velocity over the interval $0 \leq t \leq 2$.

(b) the average velocity over the interval $2 \leq t \leq 4$.

(c) the values of t at which the instantaneous velocity is zero.

(d) the moment when the particle has the highest *speed*.

(e) Describe (in words) the motion of this particle in the interval $0 \leq t \leq 8$.

Problem 3. (a) Sketch the graph of $y = f(x) = x^2 - 2x$.

(b) On your graph, draw three lines whose slopes will correspond to each of the following rates of change of f:

(i) the average rate of change of f on the interval $[1, 2]$;
(ii) the average rate of change of f on the interval $[2, 3]$;
(iii) the instantaneous rate of change of f at $x_0 = 2$.
Based on your picture, which of these is the largest?

(c) Compute algebraically the rates of change from (i), (ii) and (iii) and confirm your answer of part (b).

(d) Compute the instantaneous rate of change of f at an arbitrary point x_0.

Problem 4. For most wide-screen TVs, the ratio (width of screen)/(height of screen) is 16/9. Let us call a TV with this property a 16:9 TV.

(a) For a 16:9 TV, what is the angle that the diagonal is making with the horizontal? Leave your answer as an inverse trigonometric function.

(b) For a 16:9 TV, find a function expressing the area of the screen, A, in terms of its diagonal length d.