Math 261 – Summer Lab 6 **Derivatives and Rate of Change** Name_____

Show all work for credit. Also, give exact answers unless otherwise noted.

1. The position function *s* of a particle moving along a coordinate line *l* is given by $s(t) = 8t + \frac{2}{t},\ 0.25 \le t \le 8$ where the position, *s*, is in meters and the time, *t*, is in seconds.

   (a) Find the average velocity of the particle over each of the following three time intervals: *Approximate by rounding to the nearest hundred thousandth.*
   [4, 4.1] [4, 4.01] [4,4.001]

   (b) Find the velocity of the particle at any time *t*, i.e., find *v*(*t*).

   (c) When is the velocity of the particle 6 meters per second?

   (d) Find the velocity at 4 seconds.

   (e) In what direction is the particle moving at 4 seconds?

   (f) When does the particle reverse directions?

2. Let a function g be defined by $g(x) = 2x^2 - 3x + 10$.

(a) Use the definition of the derivative to find $g'(x)$.

(b) Find the slope of the tangent line to the graph of g at $(x, g(x))$.

(c) Find $g'(3)$.

(d) Find the slope of the tangent line to the graph of g at (3,19).

(e) Find $g'(-2)$.

(f) Find the slope of the tangent line to the graph of g when the x-coordinate is –2.

(g) Find $g'(x)$ when $g(x) = 15$.

(h) Find the slope of the tangent line to the graph of g when the y-coordinate is 15.

(i) Find $g(x)$ when $g'(x) = 21$.

(j) Find the point(s) on the graph of g at which the slope of the tangent line is 21.

(k) Find the equation of the tangent line to the graph of g at the point when the x-coordinate is -2.