Section Summary: 1.4

a. Definitions

- **tangent** line: “touching” line
- **secant** line: “cutting” line
- **average velocity**: $\frac{\text{change in position}}{\text{change in time}}$
- **instantaneous velocity**: the velocity at an instant (so it is the average velocity as the change in time tends to zero).

b. Summary

These two problems illustrate the need for limits: tangent lines are limiting cases of secant lines; instantaneous velocity is the limiting case of average velocity. Both of them appear to involve the calculation of a slope.

This is the crucial idea of the differential calculus (derivative calculus): derivatives are slopes.

Some good graphs/examples to consider include Figure 1, p. 45 (the tangent line is the “kissing” line); Figures 3, p. 46 (illustrates the tangent line as the limiting case of secant lines); Figure 4, p. 46 (shows that we can use an approximation of an average slope to the instantaneous slope).