



Unit 7B Assignment

Work slowly and carefully. If you are having difficulty, go back and review the appropriate *Lesson*.

As your midterm and final exams do not allow calculators, it is best to attempt all questions in this *Assignment* without a calculator.

Be sure to proofread your assignment carefully.

For full marks, show all calculations, steps, and/or explain your answers.

Total: 42 marks.

1. An object is moving in a straight line. The object's displacement, in metres, from a fixed point is given by $s(t) = 2t^3 - 15t^2 + 24t + 8$, where $t \geq 0$ and t is in seconds.

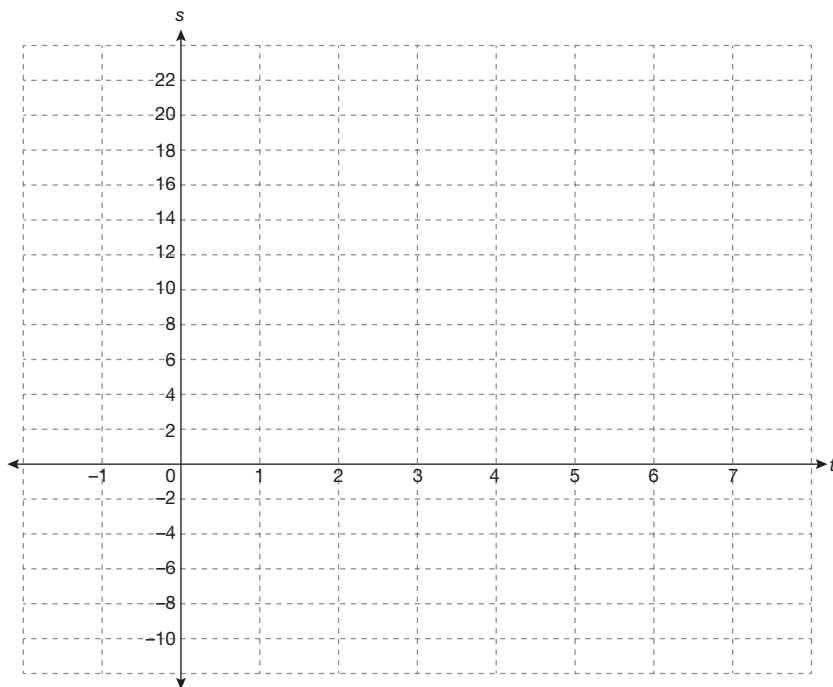
2

- a. Find the velocity and acceleration at any time t .

3

- b. Determine the turning point(s) of the object.

1

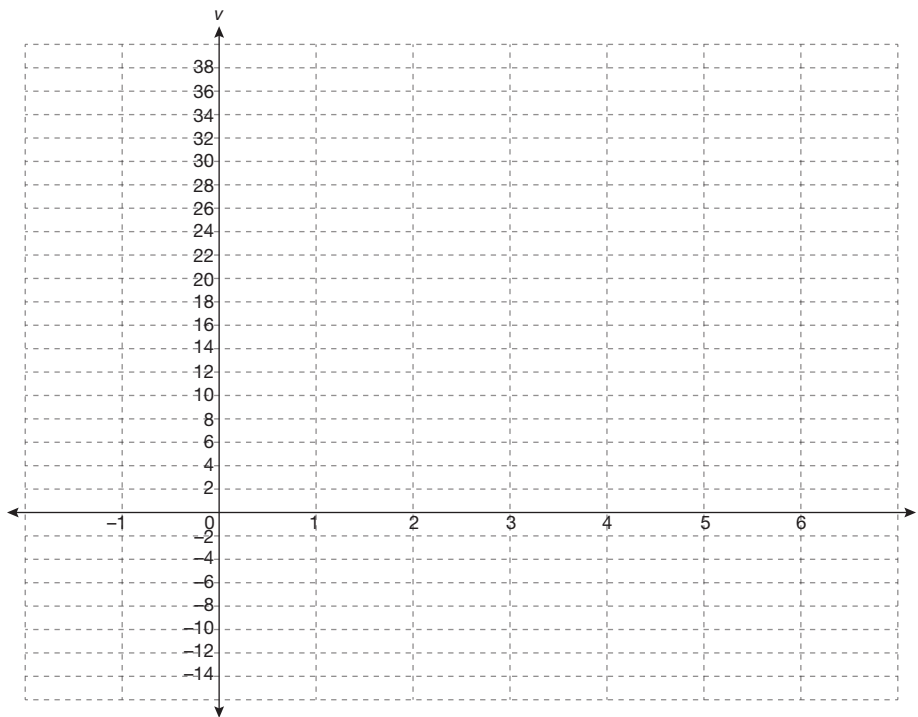
c. Sketch the graph of the function $s(t)$.

2

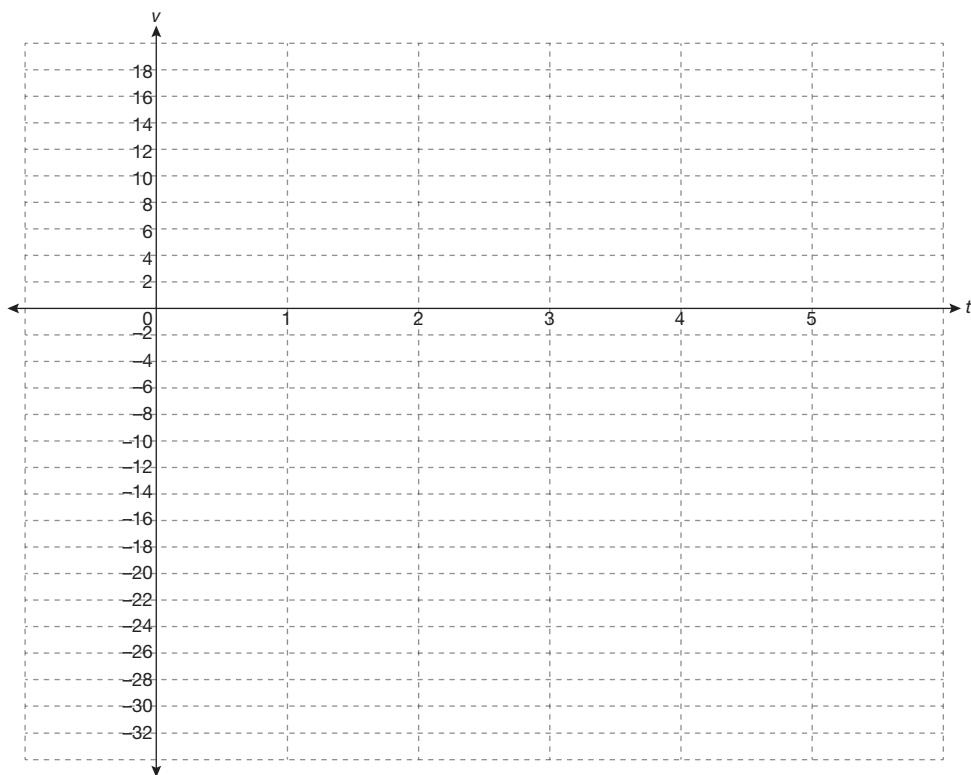
d. Describe the direction of the motion of the object at $t = 0, 1, 3, 4$, and 5 .

2

e. Sketch a graph of $v(t)$ and describe the velocity of the object.



- 2 f. Sketch a graph of $a(t)$ and describe the acceleration of the object.



- 4 2. A particle is moving in a straight line. Its position, in metres, from a fixed point is given by $s(t) = \frac{t^2}{3+t}$, where $t \geq 0$ and t is in seconds. Determine the acceleration of the particle when its velocity is $\frac{3}{4}$ m/s.

3. The position function of a particle is given, in metres, as $s(t) = t^4 - 10t^3 + 36t^2 + 10t + 12$, where $t \geq 0$ and t is in seconds. Find the intervals for which the acceleration of the particle is positive and negative.

4. The relation between the velocity and displacement of an object is given by $5v^2 = 40s + 200$, where s is the displacement from a fixed point, in metres, and v is the velocity of a moving object, in metres per second. Find the acceleration of the object.

5. A golf ball was hit vertically upward with a pitching wedge. The position of the ball, in metres, is given by $s(t) = -5t^2 + 30t$, $t \geq 0$ and t is in seconds, where the origin is the ground and the positive direction is vertically upward.

2

- a. Find the maximum height reached by the ball.

2

- b. Find the velocity of the ball as it reaches the ground.

1

- c. Find the acceleration of the ball.

- 4 6. An object is moving in a straight line. The object's displacement, in metres, from a fixed point is given by $s(t) = -2t^3 - 4t^2 + 6t + 4$, where $t \geq 0$ and t is in seconds. Determine the acceleration of the object when the velocity is -2 m/s.
- 2 7. The velocity $v(t)$ of an object travelling in a straight line is given by $v(t) = 3t - 24t^2$, where $t \geq 0$ and t is in seconds. Find the position function $s(t)$ of the object if $s(t) = 2$ when $t = 2$.

- 5 8. A ball is tossed upward from the top of a tower, located 50 m above the ground. If the ball has an initial velocity of 15 m/s, how long will it take to hit the ground? Assume $a(t) = -10 \text{ m/s}^2$.

- 5 9. The retro-rockets of a space capsule provide a constant deceleration of 60 m/s^2 . If they are fired for 10 s , and the motion is assumed to be in a straight line, what is the decrease in velocity during that time if the initial velocity of the space capsule is $6\,000 \text{ m/s}$? What distance does the space capsule travel in the 10 s ?