Math 140 **Tutorial 8**
Feb 24 - Mar 6

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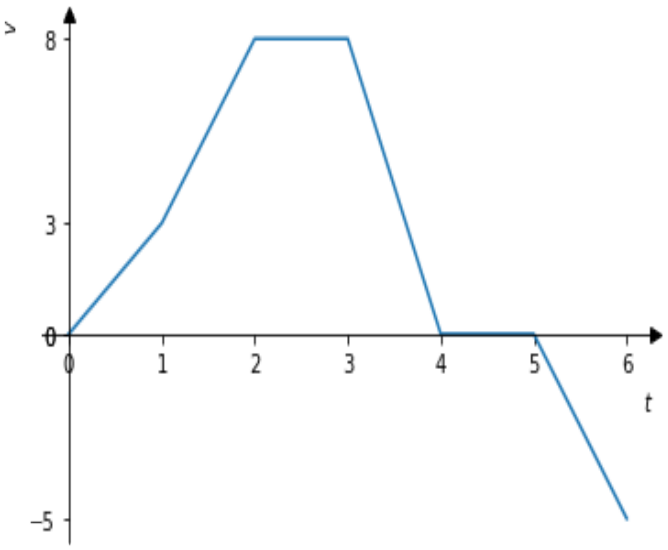
1. The graph below shows the velocity v in metres per second of a particle at time t seconds.



   (a) Describe the motion of this particle. When is it moving forwards? When is it accelerating? When is it decelerating?

   (b) Express the velocity $v(t)$ as a function of t.

   (c) Sketch a graph of the acceleration of this particle.

   (d) Express the acceleration $a(t)$ of the particle as a function of t

   (e) Sketch a graph for the position of this particle.

   (f) *Bonus:* Express the position $s(t)$ as a function of t, where the position of the function at time $t = 0$ is 0. i.e. $s(0) = 0$.

2. Suppose we have a circle inscribed in a square.

   (a) If the perimeter of the square is increasing at a rate of 10 m/s, at what rate is the circumference of the circle increasing?

   (b) If the area of the circle is increasing at a rate of 10 m^2/s, at what rate is the diagonal of the square increasing when the area of the circle is π?

3. If \$1500 is borrowed at 8% interest, find the amounts due at the end of 5 years if the interest is compounded:

   (a) annually;

   (b) monthly;

   (c) daily;

   (d) continuously.

   Hint: Have a look at Section 3.8, Example 3 in the textbook.

4. Recall that the rate of cooling of an object is proportional to the difference in temperature between the object and its surrounding.

   A freshly brewed cup of coffee has temperature 95°C in a 20°C room. When its temperature is 70°C, it is cooling at a rate of 1°C per minute. When does this occur?

5. Two cars start moving from the same point. One travels south at 60 km/h and the other travel west at 25 km/h. At what rate is the distance between the cars increasing two hours later?

6. A particle is moving along the curve $y = \sqrt{x}$. As the particle passes through the point (4,2), its x-coordinate increases at a rate of 3 units/s. How fast is its y-coordinate changing at this instant? *Hint: think of the coordinates as functions of time, $y = y(t)$ and $x = x(t)$; what can you say about the coordinates of the particle at time t?.*