Student #: _____ Student Name: _____

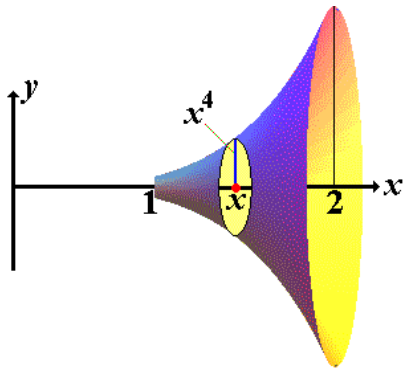
AP Physics Class 1: Calculus in Physics

Differentiation

1. Given an object whose displacement is given by $d(t) = 3t^3 + 3t^2 \ \ (t \geq 0)$, find out
   (a) Its average velocity between $t = 2\,\text{s}$ and $t = 5\,\text{s}$.
   (b) Its instantaneous velocity at $t = 2\,\text{s}$.
   (c) Its acceleration at $t = 2\,\text{s}$.
   (d) If its mass is $2\,\text{kg}$, find the net force on this object as a function of time.
2. What would the force be in question 1 if the mass changes by time as $m(t) = 2 + 0.1t$?
3. An object moves on a plane as $\mathbf{d}(t) = \left(2t^2, \frac{1}{t}\right)$ for $(t \geq 2\,\text{s})$. Find out
   (a) Its displacement when $t = 3\,\text{s}$.
   (b) It velocity and speed when $t = 3\,\text{s}$.
   (c) Its acceleration as a function of time and the magnitude of the acceleration.

Integration

4. An object has velocity $v(t) = t^2 - 2t$ for $(t \geq 0)$:
   (a) Describe its motion
   (b) Find its displacement in 5 seconds.
   (c) Find its displacement between 3 and 5 seconds.
5. Find the volume of the following shape:



6. A force $F(t) = 3t^3$ is applied on an object with mass $m = 2\,\text{kg}$. Find the displacement and work done on this object when $t = 4\,\text{s}$.