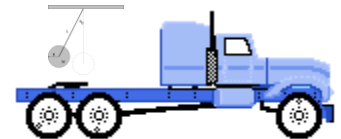


## Unit 04 Sample Test

K/U

- 1) Determine an expression for  $\frac{dy}{dx}$ .  $3(y - 2)^3 - x^3 = 4x - 6$ . [2]
- 2) What is the absolute min and absolute max of the following function on  $[-5, 2]$ .  
 $f(t) = t^3 - 12t + 2$  [3]
- 3) Determine the absolute maximum and minimum values of  $f(x) = x^2e^x$  on  $x \in [-5, 1]$ . [4]
- 4) A particle is moving along the  $x$ -axis according to  $s(t) = t + \sin(t)$  where  $t$  is in seconds,  $t \geq 0$ , and  $s(t)$  is in meters. [6]
  - a) Give the velocity function of the particle in terms of  $t$ .
  - b) How fast is the particle traveling at  $\pi$  seconds?
  - c) What is the average velocity in the first  $2\pi$  seconds?
  - d) When is the particle at rest?
- 5) The perimeter of a rectangle is 36 m. Use a calculus approach to determine the maximum area of such a rectangle. [4]



APPS

- 6) What is the area of the largest rectangle that has its base on the  $x$ -axis, its lower left corner at  $(0, 0)$  and its upper right corner on the graph of  $f(x) = \sqrt{9-x}$ ? [5]
- 7) An open top box, with a square base is being designed. Material costs  $12\phi/\text{cm}^2$ . What is the largest box that can be built for \$51.84. [5]
- 8) Car A is 40 km east of Car B and begins moving west at 40 km/h. At the same moment, Car B begins to move north at 70 km/h. What is the closest distance in kilometres the cars will be from each other and at what time  $t$ , in hours, will that distance occur? [5]

TIPS

- 9) Find the point on the parabola  $y = 10 - x^2$  closest to the point  $(0, 5.5)$ . [6]
- 10) A company is producing Netbook computers. In this manufacturing process, the number of defective computers that must be rejected tends to increase as the daily output increases. The number of rejects  $r$  depends on the total daily output,  $x$ , according to the equation:  $r(x) = \frac{60x}{250-x}$ , for  $x \leq 180$  where 180 is the maximum possible output. Each computer produced is either sold or rejected. The company makes a profit of \$300 for each computer sold but loses \$100 for each one rejected. [6]
  - a) What is the profit if they produce the maximum number of computers?
  - b) What output will maximize the profit?