IB Math SL **Applications**

Topic 6, Part I – Day 9 Notes

1. **More Trig Practice:**

**Ex 1:** Let *f*(x) = π + xsinx

1. Find *f*’(x).
2. *f*”(x) can be expressed in the form *ax* sin *x* + *b* cos *x*. Find *a* and *b*.
3. Solve the equation *f*’(x) = 0 for 0 ≤ x ≤ 2π.
4. Hence use *f*”(x) to identify the x-coordinate of any relative minimum points and any relative maximum points for *f* for 0 ≤ x ≤ 2π.
5. Find the coordinates for any inflexion points of *f* on the interval 0 ≤ x ≤ 2π.
6. **Optimization - continued:**

**Ex 1:** A business manufactures t-shirts. The cost in dollars, C, of producing a t-shirt decreases as x, the number of t-shirts manufactured, increases. The function relating the two is 

The sale price of a t-shirt, S, also decreases as x increases. The function relating x and S is 

1. Show that the profit made on the sale of 200 t-shirts is $1016.67.
2. Find the profit, P(x), on the sale of x t-shirts as a function of x, and show that 
3. Hence show when x = 155, profit is optimized (x = 155 is an extreme).
4. Show that P”(155) < 0 in order to verify that the profit is a maximum rather than a minimum.

**Ex 2:** A company is to produce cylindrical tin cans that will hold 1 L of fluid. The cost to manufacture them is to be minimized. This means that the surface area of the cans is to be as small as possible and yet still hold 1 L of fluid. The height and radius of the can will be in cm.

1. Explain why cm.
2. Show that the total surface area, A, is given by cm2.
3. Find the value of r which makes A as small as possible.
4. What would the value of h be with this radius?

**Ex 3:** A square sheet of metal of unknown size has squares cut out of the corners and then is folded to create an open box. What general equation would represent the size squares that should be cut out to create a box that holds the maximum amount?

**EXTRA CREDIT PROBLEM:** The tangent to the graph of y = x3 + x + 2 at (1, 4) meets the graph of y again. Find the coordinates of the other intersection analytically. Show work. An answer without supporting work will not be accepted. Submit on a separate sheet of paper (either today or next class).