MAT 1320 Test 2

Student Number: _____

- Time: 80 min.
- Only basic scientific calculators are permitted: non-programmable, non-graphing, no differentiation or integration capability. Notes or books are not permitted.
- Work all problems in the space provided. Use the backs of the pages for rough work if necessary. Do not use any other paper.
- Write *only* in non-erasable ink (ball-point or pen), not in pencil. Cross out, if necessary, but do not erase or overwrite. Graphs and sketches may be drawn in pencil.
- Problems require complete and clearly presented solutions and carry part marks if there is substantial correct work toward the solution.

1. [2 points] Find $\frac{dy}{dx}$ if $xy^2 + 3x^2y = xe^y$.

2. [4 points] Use logarithmic differentiation to find the derivative of $f(x) = \dfrac{x^2 \arcsin x}{(x^2+1)^3}$.

3. [4 points] Find the following limits:

(a) $\lim_{x \to 0} \dfrac{\sin x - xe^x}{x^2}$

(b) $\lim_{x \to \infty} \left(1 + \dfrac{3}{x}\right)^x$

4. [4 points] If 2700 cm^2 of cardboard is available to make a box with an open top and a square base, find the largest possible volume of the box.

5. [6 points] Consider the function $y = f(x) = x + \dfrac{2}{x}$.

(i) Find any vertical or horizontal asymptotes.
(ii) Find the intervals of increase and decrease and any local extrema.
(iii) Find the intervals of concavity and any inflection points.
(iv) Use all of the information to sketch the graph.