

## MAT 1320 Test 1

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] Solve for  $x$ :  $\ln(\ln(2x - 3)) = 2$ .

2. [2 points] Find a formula for the inverse of  $f(x) = e^{3x+7}$ .

3. [2 points] Find the derivative of  $f(x) = x^2 e^x \cos x$ .

4. [4 points] Given the function  $f(x) = 2x^2 + 3x$ ,

(a) find the average rate of change of  $f$  on

(i)  $[1, 1.1]$

(ii)  $[1, 1.01]$

(iii)  $[1, 1.001]$

(b) estimate the instantaneous rate of change at  $x = 1$

**5.** [5 points] Use the definition of the derivative to find  $f'(x)$  if  $f(x) = \frac{2x}{x+4}$ . And then use the Quotient Rule to verify your answer.

**6.** [5 points] Sketch the graph of a function satisfying:

$$f'(-3) = f'(1) = f'(5) = 0$$

$$f'(x) > 0 \quad \text{if} \quad -3 < x < 1 \quad \text{or} \quad x > 5$$

$$f'(x) < 0 \quad \text{if} \quad x < -3 \quad \text{or} \quad 1 < x < 5$$

$$f''(x) > 0 \quad \text{if} \quad x < -1 \quad \text{or} \quad x > 3$$

$$f''(x) < 0 \quad \text{if} \quad -1 < x < 3$$

Label the important features.