

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531\*\*\*. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

**Question 1.** (5 marks each) Find the following derivatives and **do not simplify**:

a.  $\frac{d}{dx} [x \ln(\cos x) - \pi \sec^2(x^2 + x + 1)]$

b.  $\frac{d}{dx} \left[ \left( \frac{\sqrt{x}e^x}{\tan x} \right)^x \right]$

**Question 2.** (5 marks) Let  $r(x) = f(g(h(x)))$ , where  $h(1) = 2$ ,  $g(2) = 3$ ,  $h'(1) = 4$ ,  $g'(2) = 5$ , and  $f'(3) = 6$ . Find  $r'(1)$ .

**Question 3.** (5 marks) Given the curve  $x^3 - y = 3x^2 - x + 4$ , find all the point(s) on the curve where the tangent is parallel to the line  $10x - y = 25$ .

**Question 4.** (5 marks) For the curve  $\ln x + xy = x - y$  find  $y'$  and  $y''$  in terms of  $x$  and  $y$  but **do not simplify**  $y''$ .