CAMOSUN

Name: ______________________________

Mark: $\frac{\quad}{25}$

MATH 100 (Winter, 2026)

Test 2

1. (3 marks) Find $\dfrac{dy}{dx}$ by implicit differentiation.

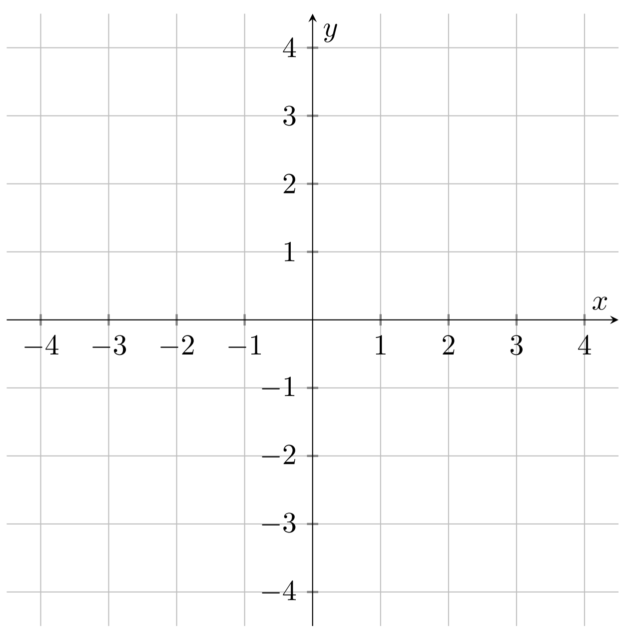
$$y \cos y = 3x^2 + 5$$

2. (3 marks) A large block of ice is in the shape of a cube. As it melts, the length of each edge of the cube decreases at a rate of 3 cm/min. At what rate is the ice cube's surface area changing when the length of the edges of the cube is 75 cm?

3. (3 marks) Find the absolute maximum and minimum values of $f(x) = x - 2\sqrt{x}$ on the interval $[0, 4]$.

4. (3 marks) Sketch the graph of a **continuous** function that satisfies $f(0) = 2$, $\lim_{x\to\infty} f(x) = 3$ and whose first and second derivatives have the following signs in the indicated intervals.

	$(-\infty, 0)$	$(0, \infty)$
$f'(x)$	$-$	$+$
$f''(x)$	$+$	$-$



5. Let $f(x) = \sin x + x + 1$.

   (a) (3 marks) If Newton's Method were used to approximate a zero of f using an initial approximation of $x_1 = -0.5$, then compute the next approximation x_2. Round your answer to four decimal places.

   (b) (4 marks) Verify that f satisfies the conditions of the Mean Value Theorem on the interval $[-\pi, \pi]$ and then find the value(s) of c guaranteed to exist by the theorem.

6. (6 marks) An open-top box has a rectangular base that is three times as long as it is wide. Find the dimensions of such a box having the smallest surface area if its volume is 144 cm^3. Use the First Derivative Test to verify that your answer minimizes surface area.