

Show all work, including indications of mental steps, on the lined paper provided. Label and separate clearly (draw lines) each part of each problem and **box** each final short response requested (and nothing else). Use proper mathematical notation: "symbol" = "expression representing symbol" = ... Don't misuse equal signs (use ":" or "→" to indicate a relationship which is not equality), but do connect equal expressions with equal signs. Give exact answers, not decimal approximations (unless requested). Nothing on this test may be justified or supported by technology output, but you may use technology to check your work. This is a test about thinking, reasoning, and good communication of the process. You may not access the web or any existing computer files for help. Simplify all results.

①  $y = x^2 e^{-x}$  a) Evaluate  $\frac{d^2y}{dx^2}$  and  $\frac{d^2y}{dx^2} \Big|_{x=1}$ .

b) Find all values of  $x$  for which the tangent line is horizontal.

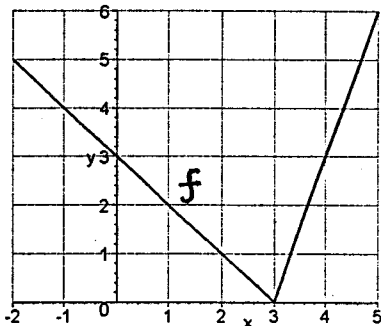
② Find an equation for the tangent line to the graph  $y = \frac{1-x}{1+x}$  at  $x = -2$ , giving your final result in the standard form  $y = \dots$ .

③  $y = x^{\sin x}$  Use logarithmic differentiation to evaluate  $\frac{dy}{dx}$  and  $\frac{dy}{dx} \Big|_{x=1}$ .

④ If  $x^2 + xy + y^2 = 7$ , find  $\frac{dy}{dx}$  and its value at the point  $(x, y) = (1, 2)$ .

⑤  $h(\theta) = \sqrt{4 - 3\sin^2(5\theta)}$ . Evaluate  $h'(\theta)$ . [Recall  $\sin^2 x = (\sin x)^2$ .]

⑥



$f$  has the graph shown and  $h(x) = f(f(x))$ . Evaluate  $h(-1)$  and  $h'(-1)$ .

Explain where each number comes from in this process.

After completing the exam, read and sign the following pledge, if it applies to you:

During this examination, all work has been my own and I have not opened any software other than MAPLE on my computer. I give my word as a decent human being that I have not resorted to any ethically questionable means of improving my performance or that of any one else on this examination, nor will I after I complete it.

Date: Nov 13, 2000

Signature: