

CALCULUS A, IN-CLASS TEST 2

A large part of the purpose of this test is to make sure you know the formulas and the procedures to compute derivatives and related ideas by hand.

This exam should therefore be done without reference to your book or notes, and without a calculator or Maple.

You need not simplify the results of your calculations. As always in math, you should show me what you are doing, explaining so a reader can understand and follow your work. When I ask for numerical answers, please give me exact expressions. I'm looking for exact answers like e^π , not numerical approximations like 23.140692632779269007.

Please remember that you are writing to be read.

1. (a) State a definition of the derivative in terms of limits.
- (b) Use this definition and nothing more sophisticated to compute $f'(1)$ when $f(x) = x^3 + 2x$.

2. Compute the derivatives of the following functions of x . Do not bother to simplify your answers.

(a) x^e .

(b) e^x .

(c) e^e .

(d) x^x .

(e) $x^{-7} - 3\sqrt{x} + \frac{5}{x}$.

(f) $\sqrt{x \cos x}$.

(g) $\frac{x^5 e^x}{7x^3 + 5x}$.

(h) $2^{\log_2 x}$. (*Hint*: Thinking a moment is your friend.)

3. State general formulas for the following derivatives:

(a) $\left(\frac{g(\sqrt{x^2+1})}{\sqrt{x^2+1}}\right)'$.

(b) The second derivative $\frac{d^2}{dx^2}(f(x)g(x))$.

(c) $\frac{d^2}{dx^2}(f(g(x)))$.

4. Find the equation (not just the slope) of the tangent line to the curve $y = x^3 + 4x^2 - 7$ at the point $(1, -2)$.

5. Evaluate exactly the expression $\sin(\arctan 3)$. Remember that triangles are your friends.