

MATH 224-001 — TEST I*PLEASE READ THESE INSTRUCTIONS:*

Problems have varying point values, which are specified next to each problem number. Move quickly through the test, but try to be as accurate as you can. Do as many problems as you like; points over 100 will count as extra credit.

If you want credit for an answer, *you must explain what you are doing – this means defining your terms and explaining each step in your work.*

You may use a graphing calculator, but **not** a calculator (such as the *TI-89*) capable of symbolic manipulation. You may not use your book or notes.

PLEASE TURN OFF YOUR CELL PHONE.

[Please do not write in the boxes below:]

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(10) **1** Is the function $f(x) = \frac{x+1}{2x+1}$ one-to-one? If so, what is its inverse? If not, why not?

(10) **2** If $f(x) = 3 + 4x + e^x$, find $(f^{-1})'(4)$.

(8) **3** Solve the equation $\ln(x+1) + \ln(x-1) = 1$ for x .

(2+10) **4** What are the exact values of
(a) $\ln e^\pi$ and

(b) $\tan(\arcsin \frac{1}{2})$.

(10+10+15) **5**

Compute the derivative $\frac{dy}{dx}$ (in terms only of x) if

(a) $y = \ln(x^2 e^x)$ and

(b) $y = (\sin^{-1}(2x))^2$ and

(c) $y = (\cos x)^x$.

(15+5) **6**

Say that a bacterial population starts with 100 bacteria and doubles every three hours.

(a) Find the general expression for the bacterial population as a function of time.

(b) When will the population reach 50,000?

(15) **7** Evaluate $\int_0^{\pi/2} \frac{\cos x}{1 + \sin^2 x} dx$.

(15) **8** Evaluate $\int \frac{2 \cos(\ln x)}{x} dx$.

(10) **9** Compute $\lim_{x \rightarrow 0} \frac{e^x - 1}{x^5 + 3x}$.

(15) **10** Compute $\lim_{x \rightarrow 0} (1 - 6x)^{1/x}$.