

20100 Calculus I, Spring 2003

Test 2, March 18, 2003

1	2a	2b	3	4	5	6	7	8	9	10

Full name:

Student ID:

Statement of integrity: I did not, and will not, break the rules of academic integrity on this test.

Signature

Show all your work. Every problem is 10 points worth except bonus which is 20 points. Good luck!

1. Check if the limit exists, find its value if it exists.

$$\lim_{x \rightarrow 0} \frac{\sqrt[4]{(x-1)^4}}{|x-1|}$$

2. Use the Squeeze Theorem to find the following limits

$$\lim_{x \rightarrow 0} (x + \sin x) \left(2 + \sin \frac{1}{x} \right)$$

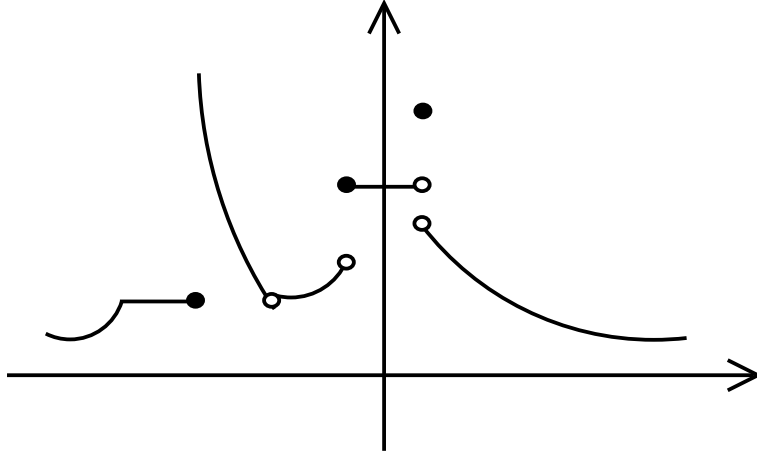
(bonus)

$$\lim_{x \rightarrow 0} (x + \sin x)^2 \left(x + \sin \left(1 + \frac{1}{x^2} \right) \right)$$

3. Compare the values of the following limits

$$\lim_{x \rightarrow 0} \frac{x}{e^x - 1} \quad \text{and} \quad \lim_{x \rightarrow 0} \frac{x^2}{e^x - 1}$$

4. List every point of discontinuity of the function shown on the graph and determine its type (removable, jump, etc)



5. List the points of discontinuity of the following function

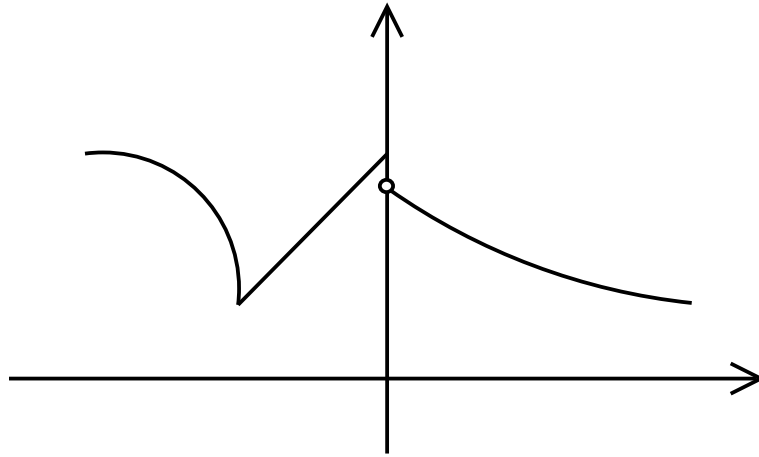
$$f(x) = \begin{cases} \frac{x^2+x+1}{x^2-2}, & x < 2\pi \\ \tan x, & x \geq 2\pi \end{cases}$$

6. Use the Intermediate Value Theorem to show that there is a root of the given equation in the specified interval

$$e^x - 1 = \cot\left(\frac{\pi}{2} - 1 + x\right), \quad x \in (0, 1)$$

7. Find the derivative of $f(x) = \sqrt{\frac{x}{x+1}}$ using the definition of derivative. State the domain of the function and the domain of its derivative.

8. Sketch the graph of the derivative of the function shown on the picture



9. Find the derivative of the following function (using derivation formulas)

$$f(x) = \sqrt[3]{\cos x} + \frac{x \cdot g(x)}{x + 1}$$

10. You are producing open cubical boxes (without one side) of different volumes. The material costs \$2 per ft². Find $\frac{dC}{dV}$ - the derivative of the total cost with respect to the volume (Hint: first you have to find how the cost depends on the volume).