

## MAC 2313 Calculus III, Worksheet 4B - Calc I Review

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### Directions:

- Provide the answer in the method and the format the question requires.
  - You may not work out more than one problem per page (one sheet has two pages).
  - Write down the answers legibly. Unrecognizable steps/works will not be considered for grading.
  - Simplify to the best possible. Showing the work is necessary and important. No work means no points.
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Q1) Qn 1: If  $f(x) = \sec\left(\frac{\pi(\sqrt{x^2+1})}{2}\right)$  then  $f(0) =$  \_\_\_\_\_.

Qn 2: If  $f(x) = \sin(x+1)$ ,  $g(x) = e^{(x-1)^2-1}$ , and  $h(x) = 1 + \ln x$ , then  $(h \circ g \circ f)(x) =$  \_\_\_\_\_.

Qn 3:  $\lim_{x \rightarrow 0} \frac{1}{x} =$  \_\_\_\_\_.

Qn 4: True or False: The function  $f(x) = x^4 - x^2 + 1$  has a zero by the Intermediate Value Theorem.  $T / F$

Q2) (a) Let  $f(x) = \sqrt{5 - \sin x}$  and  $g(x) = \sqrt{x^2 - 9}$ , find  $f \circ g$  and the domain of  $\frac{f}{g}$ .

(b) Derive the value of  $\log_2 80 - \log_2 5$ .

Q3) (a) Derive the inverse of the function  $f(x) = e^{2x-3}$ .

(b) Derive the value of  $\lim_{x \rightarrow 9} \frac{\sqrt{x-3}}{x-9}$ .

Q4) Derive the limit of  $\lim_{t \rightarrow 0} \left( \frac{1}{t^2(\sqrt{1+t^2})} - \frac{1}{t^2} \right)$ .

Q5) Derive the derivative of  $f(x) = \sqrt[3]{x}$  (Do not use the power rule, finding the derivative using the power rule will have 0 points).

Q6) Derive the derivative of  $f(x) = \frac{(e^x \sin(2x) + \ln x)}{e^{-2x}}$

Q7) Find the equation of the tangent line of the function  $f(x) = \left( \ln(\sqrt{x+1} + e^x) \right)^2$  at  $x = 0$ .

Q8) Find the Absolute maximum of the function  $x^{\frac{3}{5}}(4 - x^2)$  from  $[0, 3]$ .

Q9) Let  $f(x) = 3x^4 - 4x^3 - 12x^2$ . Find

- Critical Value(s)
- Intervals in which  $f$  is increasing and/or decreasing
- Local Extrema
- Concavity
- Point(s) of Inflection, if any.

Q10) Find  $f$  if  $f''(x) = \cos(\frac{\pi}{2}x) + \frac{1}{x^2} + e^x + x$ ,  $f(1) = 1$  and  $f'(1) = 2$ .

Q11) Find the value of  $\int_0^1 \left[ \left( \frac{2t^2 + t^2\sqrt{t}}{t^{3/2}} \right) + \sin(t) \right] dt$ .

Q12) Find  $\int (\sqrt{1-x^2})x^5 dx$ .