

NAME: \_\_\_\_\_

## **Calculus I - Spring 2014**

### **Midterm Exam II, April 21, 2014**

In all non-multiple choice problems you are required to show all your work and provide the necessary explanations everywhere to get full credit. In all multiple choice problems you don't have to show your work.

1. If  $f(x) = x + \cos x$ , then  $(f^{-1})'(1)$  is

Ⓐ  $\frac{1}{1 + \cos 1}$

Ⓑ 0

Ⓒ  $-\sin 1$

Ⓓ 1

Ⓔ  $1 + \cos 1$

2. Let  $f(x) = 1 - 2\sqrt[3]{x}$ , then  $f^{-1}(x)$  is

Ⓐ  $\frac{1 - x^3}{8}$

Ⓑ  $\frac{(1 - x)^3}{8}$

Ⓒ  $\frac{(x - 1)^3}{8}$

Ⓓ  $\frac{x^3 - 1}{8}$

Ⓔ None of the above

3. Compute the linearization of  $f(x) = \sqrt{x}e^{x-1}$  at  $a = 1$ .

- Ⓐ  $L(x) = \frac{3}{2}x + \frac{1}{2}$
- Ⓑ  $L(x) = -\frac{3}{2}x + \frac{1}{2}$
- Ⓒ  $L(x) = -\frac{3}{2}x - \frac{1}{2}$
- Ⓓ  $L(x) = \frac{3}{2}x - \frac{1}{2}$
- Ⓔ None of the above

4. If  $f(x) = (2 - x)^x$ , then  $f'(x)$  is

- Ⓐ  $x(2 - x)^{x-1}$
- Ⓑ  $(2 - x)^x \ln(2 - x) - x(2 - x)^{x-1}$
- Ⓒ  $(2 - x)^x \ln(2 - x) + x(2 - x)^{x-1}$
- Ⓓ  $-x(2 - x)^{x-1}$
- Ⓔ  $(2 - x)^x \ln(2 - x) - x(2 - x)^{x+1}$

5. Find the slope of the tangent line at the point  $(1, 1)$  on the graph of  $e^{x-y} = 2x^2 - y^2$ .

- Ⓐ 0
- Ⓑ  $-1$
- Ⓒ 1
- Ⓓ 2
- Ⓔ 3

6. If  $f(x) = 2^{1+\arctan x}$ , then  $f'(x)$  is

- Ⓐ  $\frac{2^{1+\arctan x}}{(1-x^2)\ln 2}$
- Ⓑ  $\frac{2^{1+\arctan x}}{1+x^2}$
- Ⓒ  $\frac{2^{1+\arctan x} \ln 2}{1+x^2}$
- Ⓓ  $\frac{2^{1+\arctan x}}{(1+x^2)\ln 2}$
- Ⓔ  $\frac{2^{1+\arctan x} \ln 2}{\sqrt{1-x^2}}$

7. Find the differential of  $f(x) = \sqrt{1 - 2x}$ .

Ⓐ  $-\frac{dx}{\sqrt{1 - 2x}}$

Ⓑ  $-\frac{dx}{2\sqrt{1 - 2x}}$

Ⓒ  $\frac{dx}{\sqrt{1 - 2x}}$

Ⓓ  $\frac{dx}{2\sqrt{1 - 2x}}$

Ⓔ None of the above

8. Let  $f(x) = \arcsin x$ , then  $f^{-1}(x)$  is

Ⓐ  $\sin x, 0 \leq x \leq 1$

Ⓑ  $\frac{1}{\sin x}, -1 \leq x \leq 1$

Ⓒ  $\sin x, -1 \leq x \leq 1$

Ⓓ  $\sin x, -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

Ⓔ  $\sin x, 0 \leq x \leq \pi$

9. Find  $\lim_{x \rightarrow \sqrt{3}^+} 5^{1/(3-x^2)}$ .

- Ⓐ 0
- Ⓑ Does not exist and neither  $\infty$  nor  $-\infty$
- Ⓒ  $\infty$
- Ⓓ  $-\infty$
- Ⓔ None of the above

10. Find  $\lim_{x \rightarrow \sqrt{3}^+} 5^{1/(x^2-3)}$ .

- Ⓐ  $\infty$
- Ⓑ  $-\infty$
- Ⓒ Does not exist and neither  $\infty$  nor  $-\infty$
- Ⓓ 0
- Ⓔ None of the above

1. Find  $\lim_{x \rightarrow 0} \left( \frac{1}{\ln(x+1)} - \frac{1}{x} \right)$ .

2. Let  $f(x) = xe^x$ .

(a) Find the  $x$ -intercept of  $f$ .

(b) Find the  $y$ -intercept of  $f$ .

(c) Is the function  $f$  even, odd, or neither? **Justify!**

(d) Find the horizontal asymptote of  $f$ .

(e) Does  $f$  have any vertical asymptote? **Justify!**



(f) Find the intervals of increase and decrease of  $f$ .

(g) Find local maximum and minimum value(s) of  $f$  (if any).

(h) Find absolute maximum and absolute minimum values of  $f$  on  $[-2, 1]$ .

(i) Find the intervals of concavity of  $f$ .

(j) Find the inflection point of  $f$ .

(k) Sketch the graph of  $f$ .