

Please print your name clearly:.....

**Final Exam Math 1451 Fall 2017**

You may **not** use any printed/written material or electronic devices (including calculators and cell phones). For the Multiple Choice Problems, please choose only one answer. For the show-work answers, please use the space provided in the exam. **Note that the exam is double-sided. All your work must be included and submitted on this printout; no additional paper is collected.** Please abide by the academic integrity rules: cheating, copying from another student, receiving or giving help on the exam will result in a score of 0 on the final - and will be reported to administrative offices, which will take appropriate action in the matter.

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**Multiple Choice Part**

Part D: Differentiation.

Evaluate the derivative of each of the following functions **at the point**  $x = 0$ , and choose the correct answer from the a)-d) group provided:

D1)  $f(x) = x^4 + x^3 - x^2 + 1$

Answer: a). 0;    b). 5;    c). -9 ;    d). none of the above

D2)  $f(x) = \arctan(2017x) + 2017x^2 + 2018$

Answer: a). 0;    b). 2017;    c). 4035 ;    d). none of the above

D3)  $f(x) = \cos^2 x$

Answer: a). 0;    b). -1 ;    c). 1 ;    d). none of the above

D4)  $f(x) = xe^x$

Answer: a). 0;    b). 1 ;    c).  $e$  ;    d). none of the above

D5)  $f(x) = \frac{x}{x^2 + 1} + 7$

Answer: a). 0;    b). 1 ;    c). 2 ;    d). none of the above

D6)  $f(x) = \arccos x + 2017x^2$

Answer: a). 2017;    b). 1;    c). -1 ;    d). none of the above

D7)  $f(x) = \frac{x^3 - 1}{x - 1}$

Answer: a). 0;    b). 1;    c). -1 ;    d). none of the above

D8)  $f(x) = (x + 1) \cdot \ln(x + 1)$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

D9)  $f(x) = \tan(2017x) + x$

Answer: a). 0;    b). 2017;    c). 2018 ;    d). none of the above

D10)  $f(x) = 2 \cos x \sin x$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

## Part I: Integration.

Evaluate the following definite integrals, and choose the correct answer from the a)-d) group provided:

$$\text{I1) } \int_0^{\pi} \sin(2x) \, dx$$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

$$\text{I2) } \int_0^1 2018 \cdot x^{2017} \, dx$$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

$$\text{I3) } \int_0^1 \frac{e^{2x}}{e^2 - 1} \, dx$$

Answer: a). 0;    b). 0.5;    c). 1 ;    d). none of the above

$$\text{I4) } \int_0^{\pi/4} \sec^2 x \, dx$$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

$$\text{I5) } \int_0^1 \frac{1}{1+x^2} \, dx$$

Answer: a). 0;    b).  $\pi$ ;    c).  $\pi/4$ ;    d). none of the above

$$\text{I6) } \int_0^1 \frac{2x}{1+x^2} \, dx$$

Answer: a). 0;    b).  $\ln 2$ ;    c). 1;    d). none of the above

$$\text{I7) } \int_{\pi/6}^{\pi/2} \cot x \, dx$$

Answer: a). 0;    b).  $\ln 2$ ;    c).  $-\ln 2$  ;    d). none of the above

$$\text{I8) } \int_0^1 2x \cdot e^{x^2} \, dx$$

Answer: a). 0;    b).  $e$ ;    c).  $e - 1$  ;    d). none of the above

$$\text{I9) } \int_e^{e^2} \frac{\ln x}{x} \, dx$$

Answer: a). 1;    b). 1.5;    c). 2 ;    d). none of the above

$$\text{I10) } \int_1^4 \frac{1}{\sqrt{x}} \, dx$$

Answer: a). 0;    b). 1;    c). 2 ;    d). none of the above

**Show Work Problems**

I). Evaluate the following limits, if they exist. Box your final answers.

(i)  $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1} =$

(ii)  $\lim_{x \rightarrow \infty} (x)^{\frac{1}{x}} =$

II). Let  $f(x) = x \cdot \ln x$ , where  $x$  is a real number. What is the domain of this function? Compute its 1st and 2nd derivatives and enter your answers in spaces provided:  $f'(x) = \dots\dots\dots$ ;  $f''(x) = \dots\dots\dots$

- (i) Draw a chart for the function  $f$ , indicating the values  $x$  corresponding to critical points and inflection points, wherever the case.
- (ii) Using the chart, indicate the intervals where the function  $f$  is increasing, decreasing, concave down and concave up, respectively.
- (iii) Sketch the graph of the function  $f$ .

**Use the remaining space on this page to work out Problem II. (You may use the back of this sheet in order to work out the multiple-choice problems.)**