

Please print your name clearly:.....

Final Exam Math 1451 Fall 2016

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 value** $x = 0$, and choose the correct answer from the a)-d) group provided:

D1) $f(x) = x^3 + 2x^2 + 5x - 9$

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

D2) $f(x) = \arctan(7x) + x + 7$

Answer: a). 0; b). 7; c). 8 ; d). none of the above

D3) $f(x) = \cos x + \sin x$

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

D4) $f(x) = xe^{2x^2}$

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

D5) $f(x) = \frac{x}{x^2 + 1} + x^{3/2} + x + 1$

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

D6) $f(x) = \arcsin(3x) + \pi/4$

Answer: a). 0; b). 1; c). 3 ; d). none of the above

D7) $f(x) = e \cdot \ln(\ln(x + e))$

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

D8) $f(x) = \ln(e^{x^2+1}) + \pi/4$

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

D9) $f(x) = \tan x + x + 1$

Answer: a). 0; b). 1; c). 2 ; 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:

$$I1) \int_1^4 \frac{1}{2\sqrt{x}} dx$$

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

$$I2) \int_0^1 3x^2 dx$$

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

$$I3) \int_1^e \frac{x^2 + 1}{x} dx$$

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

$$I4) \int_0^\pi \cos x + \sin x dx$$

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

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

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

$$I6) \int_0^1 \frac{4x}{1+x^2} dx$$

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

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

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

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

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

$$I9) \int_e^{e^2} \frac{1}{x \ln(x)} dx$$

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

$$I10) \int_0^\pi \sin x \cos x dx$$

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

Show Work Problems

I). A farmer has 400 feet of fencing to build a rectangular pen out on a field. Find the dimensions of the fenced plot that maximize the area. Justify your work using differential calculus, in order to receive proper credit, in the space provided:

II). Let $f(x) = xe^x$ where x is a real number. Its 1st and 2nd derivatives are: $f'(x) = \dots\dots\dots$; $f''(x) = \dots\dots\dots$

- (i) Draw a chart for the function f , indicating the values x corresponding to critical points and inflection points, respectively.
- (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 .

Prob II Answers: Function CHART.....GRAPH:

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

$$(i) \lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x} =$$

$$(ii) \lim_{x \rightarrow 0} (1-x)^{\frac{2}{x}} =$$

Use this space and the back to work the Multiple Choice Problems, if and where needed