

Math 112-04 Exam 3

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April 5, 2006

Name:

Instructions: Problems 1-8 are multiple choice. Mark the correct answer on your bubble sheet. For problems 9-13, write your answer on the test. You must show your work for full credit. Work on scratch paper will not be graded under any circumstance.

Problems 1 - 8, 3 pts each.

1. The function $f(x) = x^3 - 6x^2 + 9x + 3$

- a) has no local extreme points and no inflection points
- b) has local maximum at $x = 1, 3$ and inflection at $x = 2$
- c) has local minimum at $x = 1, 3$ and inflection at $x = 2$
- d) has local minimum at $x = 1$, local maximum at $x = 3$, and inflection at $x = 2$
- e) has local maximum at $x = 1$, local minimum at $x = 3$, and inflection at $x = 2$
- f) has local maximum at $x = 1$, local minimum at $x = 3$, and no inflection points

2. Find $\lim_{x \rightarrow 0} \frac{\sin(5x)}{\tan(11x)}$

- a) $\sin\left(\frac{5}{11}\right)$
- b) $\frac{0}{0}$
- c) $\sin\left(\frac{11}{5}\right)$
- d) $\frac{11}{5}$
- e) $\frac{5}{11}$
- f) The function is not continuous at 0 and so there is no limit for this expression
- g) It is impossible to take this limit because you can't divide by 0

3. Find $\lim_{x \rightarrow \infty} (\sqrt{25x^2 - 5x} - 5x)$

- a) $-\frac{1}{2}$
- b) $-\frac{3}{10}$
- c) $-\frac{7}{10}$
- d) $\infty - \infty$
- e) 0
- f) $-\frac{2}{5}$
- g) The limit does not exist

4. Find $\lim_{x \rightarrow 0} \frac{1-e^x}{\sinh x}$

- a) 0
- b) 2
- c) $\frac{1}{2}$
- d) 1
- e) -1
- f) -2
- g) $\frac{0}{0}$

5. Give the general antiderivative of $6x^6 - 4x^{-6}$

- a) $6x^7 + \frac{4}{5}x^{-5} + C$
- b) $6x^7 + 4x^{-5} + C$
- c) $\frac{6}{7}x^7 + 5x^{-5} + C$
- d) $\frac{6}{7}x^6 + \frac{4}{5}x^{-6} + C$
- e) $\frac{6}{7}x^6 + \frac{4}{5}x^{-5} + C$
- f) $36x^5 + 24x^{-7} + C$
- g) None of the above

6. Give the general antiderivative of 2^x

- a) $\ln 2(2^x) + C$
- b) $2^x + C$
- c) $\ln x(2^x) + C$
- d) $x2^{x-1} + C$
- e) $\frac{1}{x+1}(2^{x+1}) + C$
- f) The antiderivative does not exist
- g) None of the above

7. Give the general antiderivative of $x^2 - 2x$

- a) $x^3 - x^2 + C$
- b) $\frac{1}{3}x^3 - 2x^2 + C$
- c) $\frac{1}{3}x^3 - x^2 + C$
- d) $\frac{1}{3}x^3 - \frac{1}{2}x^2 + C$
- e) $2x - 2 + C$
- f) The antiderivative does not exist
- g) None of the above

8. Give the general antiderivative of $\sin x + e^{2x} - \sec x \tan x$

- a) $\cos x + \frac{1}{2}e^{2x} - \sec x + C$
- b) $-\cos x + e^{2x} - \sec x + C$
- c) $-\cos x + \frac{1}{2}e^{2x} + \sec x + C$
- d) $-\cos x + 2e^{2x} - \sec x + C$
- e) $-\cos x + \frac{1}{2}e^{2x} - \tan x + C$
- f) $-\cos x + \frac{1}{2}e^{2x} - \sec x + C$
- g) None of the above

9. (6 pts) On the interval $[0, 2\pi]$ locate the extrema and find the extreme values and classify each extremum as local or global.

$$f(x) = \ln(1 + \cos^2 x)$$

10. (8 pts) Evaluate the following:

a) $\int_{-2}^9 2|x|dx$

b) $\int_2^6 (3 + \sqrt{2 - (x - 4)^2})dx$

c) $\int_2^3 6(3 + \lfloor x \rfloor)dx$

d) $\int_0^4 (2 - x)dx$

11. (8 pts) Evaluate the definite integral as the limit of a sum

$$\int_{-1}^2 x^2 dx$$

12. (6 pts) Rewrite the limit as a definite integral

a) $\lim_{n \rightarrow \infty} \left(\tan \frac{2\pi}{n} + \tan \frac{4\pi}{n} + \cdots + \tan \frac{2n\pi}{n} \right) \frac{\pi}{n}$

b) $\lim_{n \rightarrow \infty} \left(\frac{2}{n+2} + \frac{2}{n+4} + \cdots + \frac{2}{n+2n} \right)$

13a. (8 pts) Find the value of

$$\sum_{k=1}^8 \sin^2 \frac{\pi k}{2}$$

b) Rewrite without summation notation

$$\sum_{j=1}^n e^{2j}$$

c) Rewrite using summation notation

$$1 + 3 + 5 + 7 + 9 + 11 + 13$$