MA 16500

EXAM 1 INSTRUCTIONS

VERSION 01

September 16, 2013

Your name ______________ Your TA's name ______________

Student ID # ______________ Section # and recitation time ______________

1. You must use a #2 pencil on the scantron sheet (answer sheet).

2. Check that the cover of your question booklet is GREEN and that it has VERSION 01 on the top. Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron sheet, fill in your TA's name (NOT the lecturer's name) and the course number.

4. Fill in your NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces.

5. Fill in the four-digit SECTION NUMBER.

6. Sign the scantron sheet.

7. Blacken your choice of the correct answer in the spaces provided for each of the questions 1–12. Do all your work on the question sheets. Show your work on the question sheets. Although no partial credit will be given, any disputes about grades or grading will be settled by examining your written work on the question sheets.

8. There are 12 questions, each worth 8 points. The maximum possible score is

$8 \times 12 + 4$ (for taking the exam) $= 100$ points.

9. NO calculators, electronic device, books, or papers are allowed. Use the back of the test pages for scrap paper.

10. After you finish the exam, turn in BOTH the scantron sheets and the exam booklets.

11. If you finish the exam before 7:25, you may leave the room after turning in the scantron sheets and the exam booklets. If you don't finish before 7:25, you should REMAIN SEATED until your TA comes and collects your scantron sheets and exam booklets.

Questions

1. Find the domain of the function

$$\ln(\sqrt[3]{x^2 - 2x}).$$

A. $(0, 2)$

B. $(-\infty, 0) \cup (2, \infty)$ (correct)

C. $(-\infty, 0] \cup [2, \infty)$

D. $[0, 2]$

E. $(-\infty, \infty)$

2. Find all values of x in the interval $[0, 2\pi]$ satisfying the equation

$$\sin 2x + \cos x = 0.$$

A. $\frac{\pi}{2}, \frac{3\pi}{2}$

B. $\frac{7\pi}{6}, \frac{11\pi}{6}$

C. $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$ (correct)

D. $\frac{2\pi}{3}, \frac{4\pi}{3}$

E. No such values in the given interval

3. Compute the following limits (a) and (b)

(a) $\lim_{x \to (\frac{\pi}{2})^+} e^{\tan x}$

(b) $\lim_{t \to \infty} (\sqrt{t^2 + 5t + 2} - t)$

A. (a) ∞ (b) $5/2$

B. (a) $-\infty$ (b) 0

C. (a) 0 (b) $5/2$ (correct)

D. (a) 0 (b) 0

E. (a) e (b) $1/2$

4. Solve the following equations (a) for x and (b) for y.

(a) $x = \log_8 2 + \log_8 32$

(b) $3^{3^y} = 9$

A. (a) 2 (b) $\log_3 2$ (correct)

B. (a) 2 (b) $\log_2 3$

C. (a) 8 (b) $\log_3 2$

D. (a) 8 (b) $\log_3 3$

E. (a) $\frac{1}{2}$ (b) 2

5. Consider the following function

$$f(x) = \begin{cases} x^2 - 1 & \text{if} \quad x \le 0 \\ x & \text{if} \quad 0 < x < 1 \\ 0 & \text{if} \quad x = 1 \\ 2x - 1 & \text{if} \quad x > 1. \end{cases}$$

(a) For what numbers c in the set $\{0, 1\}$ does $\lim_{x \to c^-} f(x)$ exist?

(b) For what numbers c in the set $\{0, 1\}$ does $\lim_{x \to c} f(x)$ exist?

A. (a) none (b) none

B. (a) 0 (b) none

C. (a) 0 and 1 (b) none

D. (a) 0 and 1 (b) 1 (correct)

E. (a) 1 (b) 1

6. Find a formula for the inverse of the function

$$f(x) = \frac{2x - 1}{x + 3}.$$

A. $f^{-1}(x) = \frac{3x-1}{x+2}$

B. $f^{-1}(x) = \frac{3x-1}{x-2}$

C. $f^{-1}(x) = \frac{-3x+1}{x-2}$

D. $f^{-1}(x) = \frac{-3x-1}{x-2}$ (correct)

E. $f^{-1}(x) = \frac{-3x-1}{x+2}$

7. Compute the following limit

$$\lim_{x\to 4} \frac{\sqrt{x}-2}{4-x}.$$

A. 0

B. $\frac{1}{4}$

C. $-\frac{1}{4}$ (correct)

D. $-\infty$

E. ∞

8. The graph of the function

$$y = \frac{2x^2-6x}{x^2+x-12}$$

has

A. 1 vertical asymptote and 1 horizontal asymptote (correct)

B. 1 vertical asymptote and 2 horizontal asymptotes

C. 2 vertical asymptotes and 1 horizontal asymptote

D. 1 vertical asymptote and no horizontal asymptotes

E. 2 vertical asymptotes and no horizontal asymptotes

9. Find the equation of the tangent line to the curve $y = x\sqrt{x}$ that is parallel to the line $y = 1 + 3x$.

A. $y = 3x + 4$

B. $y = 3x - 4$ (correct)

C. $y = x - \frac{4}{27}$

D. $y = 3x + \frac{5}{8}$

E. $y = 3x - \frac{5}{8}$

10. The derivative of $g(x) = \frac{\sin x}{1+\cos x}$ at $x = \frac{\pi}{6}$ is:

A. $\frac{1}{\sqrt{3}}$

B. $\frac{2}{3}$

C. $\frac{2}{2+\sqrt{3}}$ (correct)

D. - $\frac{1}{\sqrt{3}}$

E. $-\sqrt{3}$

11. Suppose we have a function $f(x)$ such that $f'(2) = 5$.

Then compute the following limit

$$\lim_{h \to 0} \frac{f(2+3h) - f(2)}{7h}.$$

A. $\frac{15}{7}$ (correct)

B. $\frac{5}{7}$

C. $\frac{3}{7}$

D. 5

E. We can not determine the limit from the given information.

12. The Intermediate Value Theorem says:

If a function $f(x)$ is continuous on the closed interval $[a, b]$, and N is a value between $f(a)$ and $f(b)$ (i.e., $f(a) \leq N \leq f(b)$ or $f(a) \geq N \geq f(b)$), then there exists $c \in [a, b]$ such that $f(c) = N$.

We want to use the I. V. Th. to show the following statement: There exists a number whose cube is exactly 5 more than itself.

If we set $f(x) = x^3 - x$, then choose the right setting for a, b and N from below.

A. $[a, b] = [-2, 0]$ and $N = -5$

B. $[a, b] = [0, 1]$ and $N = 0$

C. $[a, b] = [1, 2]$ and $N = 0$

D. $[a, b] = [1, 2]$ and $N = 5$ (correct)

E. $[a, b] = [2, 4]$ and $N = 5$