MA 16500
EXAM 3 INSTRUCTIONS
VERSION 01
November 7, 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. Let $f(x) = 2x^3 + 3x^2 - 12x + 1$.
Find

(a) the absolute maximum, and
(b) the absolute minimum

for f on the interval $[-1, 2]$.

A. (a) 14 (b) -6 (correct)
B. (a) 14 (b) 5
C. (a) 27 (b) -6
D. (a) 27 (b) 5
E. (a) 5 (b) -6

2. Let $f(x) = (1 - 2x)(x - 1)^3$ for all x over $(-\infty, \infty)$.

(a) Find the number of points at which f attains a local maximum.
(b) Find the number of points at which f attains a local minimum.

A. (a) 1 (b) 0 (correct)
B. (a) 1 (b) 1
C. (a) 0 (b) 1
D. (a) 1 (b) 2
E. (a) 2 (b) 1

3. If the second derivative of a function $f(x)$ is of the form

$$f''(x) = (x+7)^6(x+1)^5x^3(x-4)^2,$$

then how many points of inflection does the graph of $y = f(x)$ have on the interval $(-\infty, \infty)$?

A. 1

B. 2 (correct)

C. 3

D. 4

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

4. Consider the function $f(x) = \frac{1}{2}x - \sin x$ on the interval $(0, 3\pi)$.

(a) Find the number of points at which f attains a local minimum on the interval.

(b) Find the number of inflection points on the interval.

A. (a) 3 (b) 1

B. (a) 3 (b) 2

C. (a) 2 (b) 1

D. (a) 2 (b) 2 (correct)

E. (a) 1 (b) 3

5. Find the exact value for $\sin^{-1}\left(\frac{2}{3}\right) + \cos^{-1}\left(\frac{2}{3}\right)$.

HINT. Consider the function $f(x) = \sin^{-1}(x) + \cos^{-1}(x)$ on the interval $[0, 1]$. Then compute $f'(x)$, and try to see what the Mean Value Theorem says.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$ (correct)

C. π

D. 0

E. 1

6. Compute $\lim_{x \to 0} \dfrac{\tan(x) - x}{x^3}$.

A. 0

B. 1

C. ∞

D. $-\infty$

E. $\frac{1}{3}$ (correct)

7. Compute $\lim_{x \to 0^+} \dfrac{\arcsin(x)}{\sqrt{1-x^2}}$.

A. 1

B. 0 (correct)

C. -1

D. $-\infty$

E. ∞

8. Compute $\lim_{x \to \infty} x \sin\left(\dfrac{2}{x}\right)$.

A. 2 (correct)

B. ∞

C. $-\infty$

D. 0

E. 1

9. Compute $\lim_{x \to 0^+} (3x+1)^{\frac{1}{x}}$.

A. 3

B. 1

C. e

D. e^3 (correct)

E. 0

10. The graph of $y = (x - 4)e^x$ looks most like:

A. (correct)

B.

C.

D.

E.

11. Find the area of the largest rectangle that can be inscribed in a right triangle with legs of lengths 4 cm and 6 cm if two sides of the rectangle lie along the legs.

A. 2 cm^2

B. 3 cm^2

C. 4 cm^2

D. 5 cm^2

E. 6 cm^2 (correct)

12. A right circular cylinder is inscribed in a cone with height 2 and base radius 3. Find the largest possible volume of such a cylinder.

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

B. $\frac{4\pi}{3}$

C. 2π

D. $\frac{8\pi}{3}$ (correct)

E. $\frac{4\pi}{27}$