MA 16600
FINAL EXAM INSTRUCTIONS
VERSION 01
December 15, 2016

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 exam 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. Write down YOUR NAME and TA's NAME on the exam booklet.

8. There are 20 questions, each worth 10 points. Blacken your choice of the correct answer in the spaces provided for questions 1–20. Do all your work on the question sheets. Turn in both the scantron sheets and the question sheets when you are finished.

9. 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.

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

11. After you finish the exam, turn in BOTH the scantron sheet and the exam booklet.

12. If you finish the exam before 8:55, you may leave the room after turning in the scantron sheets and the exam booklets. If you don't finish before 8:55, you should REMAIN SEATED until your TA comes and collects your scantron sheets and exam booklets.

Questions

1. Find the work done by the force $\vec{F} = \langle 8, -6, 3 \rangle$ that moves an object from the point $(0, 10, 8)$ to the point $(3, 11, 14)$.

A. -36

B. -24

C. 0

D. 24

E. 36

2. The area of a triangle with the vertices $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$ is

A. $\frac{\sqrt{2}}{2}$

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

C. $\frac{\sqrt{6}}{2}$

D. $\sqrt{2}$

E. $\sqrt{3}$

3. Projection of the vector $\langle 5, 5, 5 \rangle$ to the line through the vector $\langle 0, 1, 2 \rangle$ is

A. $\langle 0, 1, 2 \rangle$

B. $\langle 0, 2, 4 \rangle$

C. $\langle 0, 3, 6 \rangle$

D. $\langle 0, 4, 8 \rangle$

E. $\langle 0, 5, 10 \rangle$

4. Find the area of the region in the first quadrant bounded above by $y = \dfrac{\pi}{2}\,x$ and below by $y = \sin^{-1} x$.

A. $1 - \dfrac{\pi}{4}$

B. $\dfrac{1}{2}$

C. $\dfrac{\pi}{2} - 1$

D. $\dfrac{\pi^2}{4} - 1$

E. $\dfrac{1}{4}$

5. Find the volume of a solid whose base is a unit disk in the xy-plane, and whose cross sections perpendicular to the x-axis are squares.

A. $\frac{4}{3}$

B. $\frac{8}{3}$

C. 4

D. $\frac{16}{3}$

E. $\frac{20}{3}$

6. The region bounded by $y = x$ and $y = x^2$ is rotated about the line $y = 1$. Find the volume of the resulting solid.

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

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

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

D. $\frac{\pi}{5}$

E. $\frac{\pi}{6}$

7. $\int_{-1}^{1} x\, e^x\, dx =$

A. $e + \frac{1}{e}$

B. $e - \frac{1}{e}$

C. $2e$

D. 0

E. $\frac{2}{e}$

8. $\int_0^{\frac{\pi}{2}} \sin^2\theta \, \cos^3\theta \, d\theta =$

A. $\frac{1}{2}$

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

C. $\frac{1}{6}$

D. $\frac{2}{15}$

E. $\frac{1}{15}$

9. $\int_2^3 \frac{dx}{x^2-5x+4} =$

A. $-\frac{2\ln 2}{3}$

B. $-\frac{\ln 2}{2}$

C. $\frac{\ln 2}{2}$

D. $\frac{\ln 2}{3}$

E. $\frac{2\ln 2}{3}$

10. $\int_{-\frac{1}{2}}^{\frac{1}{2}} \sqrt{1-x^2}\,dx =$

A. $\frac{\pi}{6} + \frac{\sqrt{3}}{4}$

B. $\frac{\pi}{3} + \frac{\sqrt{3}}{2}$

C. $\frac{\pi}{6} + \frac{\sqrt{3}}{2}$

D. $\frac{\pi}{3} + \frac{\sqrt{3}}{4}$

E. $\frac{\pi}{3}$

11. Which of the following integrals converges?

(a) $\displaystyle\int_e^\infty \frac{dx}{x \ln x}$, (b) $\displaystyle\int_0^1 \frac{dx}{\ln(1+\sqrt{x})}$, (c) $\displaystyle\int_0^1 \frac{dx}{1+\ln x}$.

A. All converge

B. All diverge

C. (a) converges, (b) and (c) diverge

D. (b) converges, (a) and (c) diverge

E. (c) converges, (a) and (b) diverge

12. Find the area of a surface obtained by rotating the curve $y = \sqrt{x}$ for $0 \leq x \leq 1$ about the x-axis.

A. $\frac{\pi}{3}(2\sqrt{2} - 1)$

B. $\frac{\pi}{6}(5\sqrt{5} - 1)$

C. $\frac{\pi}{3}(5\sqrt{5} + 1)$

D. $\frac{\pi}{4}(5\sqrt{5} - 1)$

E. $\frac{\pi}{2}(2\sqrt{2} - 1)$

13. $\lim_{n\to\infty}\left(\sqrt{n^2+n}-n\right)=$

A. 0

B. 1/2

C. 1

D. 2

E. ∞

14. Find the center of mass of the region bounded by $y = 0$ and $y = \sin x$, $0 \leq x \leq \pi$.

A. $\left(\frac{\pi}{2}, \frac{1}{4}\right)$

B. $\left(\frac{\pi}{2}, \frac{1}{6}\right)$

C. $\left(\frac{\pi}{2}, \frac{\pi}{8}\right)$

D. $\left(\frac{\pi}{2}, \frac{\pi}{6}\right)$

E. $\left(\frac{\pi}{2}, \frac{\pi}{4}\right)$

15. $\displaystyle\sum_{n=0}^{\infty} e^{-2n} =$

A. $e - 1$

B. $e^2 - 1$

C. $\dfrac{e}{e-1}$

D. $\dfrac{e^2}{e^2-1}$

E. $\dfrac{1}{e^2-1}$

16. Which of the following series converges?

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n\sqrt{n}}$, (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{1+\ln n}$, (c) $\displaystyle\sum_{n=1}^{\infty} \ln\left(1+\frac{1}{n^2}\right)$.

A. All converge.

B. All diverge.

C. (a) and (b) converge, (c) diverges.

D. (a) and (c) converge, (b) diverges.

E. (b) and (c) converge, (a) diverges.

17. The radius of convergence of the series $\displaystyle\sum_{n=1}^{\infty} \frac{x^{2n+1}}{n^2\, 3^n}$ is

A. 3

B. $\sqrt{3}$

C. 1

D. $\dfrac{\sqrt{3}}{3}$

E. $\frac{1}{3}$

18. The series $\displaystyle\sum_{n=1}^{\infty} \frac{x^{2n}}{n}$ represents the function

A. $\dfrac{1}{1-x^2}$

B. $\dfrac{1}{(1-x)^2}$

C. $\ln(1-x^2)$

D. $-\ln(1-x^2)$

E. $\ln^2(1-x)$

19. In polar coordinates, equation $r = \sin\theta + 2\cos\theta$ represents a circle with the radius

A. $\frac{1}{2}$

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

C. $\frac{\sqrt{3}}{2}$

D. 1

E. $\frac{\sqrt{5}}{2}$

20. If $z = 1 - i\sqrt{3}$ and $w = 1 - i$ then the polar form for $\dfrac{z}{w}$ is

A. $\sqrt{2}\left(\cos\dfrac{\pi}{12} + i\sin\dfrac{\pi}{12}\right)$

B. $\sqrt{2}\left(\cos\dfrac{23\pi}{12} + i\sin\dfrac{23\pi}{12}\right)$

C. $\sqrt{2}\left(\cos\dfrac{\pi}{6} + i\sin\dfrac{\pi}{6}\right)$

D. $\sqrt{2}\left(\cos\dfrac{11\pi}{6} + i\sin\dfrac{11\pi}{6}\right)$

E. $\sqrt{2}\left(\cos\dfrac{\pi}{3} + i\sin\dfrac{\pi}{3}\right)$