MA 16200
EXAM 1 Form 01
September 20, 2022

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

Be sure the paper you are looking at right now is GREEN! Write the following in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below the boxes on the scantron: **01**

You must use a #2 pencil on the scantron answer sheet. Fill in the following on your scantron and blacken the bubbles

1. Your name. If there aren't enough space for your name, fill in as much as you can.
2. Section number. If you don't know your section number, ask your TA.
3. Test/Quiz number: **01**
4. Student Identification Number: **This is your Purdue ID number with two leading zeros.**

There are **12** questions, each worth 8 points (you will automatically earn 4 points for filling out your student ID number correctly). Blacken in your choice of the correct answer in the spaces provided for questions 1–12. Do all your work in this exam booklet. Use the back of the test pages for scrap paper. Turn in both the scantron and the exam booklet when you are finished.

If you finish the exam before 8:50, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20. If you don't finish before 8:50, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT SIGNATURE: _____

1. The center and the radius of the sphere represented by

$$x^2 + y^2 + z^2 + 8x - 6y + 2z + 17 = 0$$

are:

A. $(4, 3, 1)$ and 3

B. $(4, -3, 1)$ and 3

C. $(8, -6, 2)$ and 5

D. $(-4, 3, -1)$ and 3

E. $(-4, 3, -1)$ and $\sqrt{17}$

2. For what values of b are the vectors $< -6, b, 2 >$ and $< b, b^2, b >$ orthogonal?

A. 0, 1 and -1

B. 0, 3 and -3

C. 0, 2 and -2

D. 0, $2\sqrt{2}$ and $-2\sqrt{2}$

E. 0, 1 and 2

3. The angle between $\boldsymbol{a} =< 1, 0 >$ and $\boldsymbol{b} =< 1, \sqrt{3} >$ is:

A. $-\dfrac{\pi}{6}$

B. $\dfrac{\pi}{4}$

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

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

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

4. A sled is pulled 100 m along a horizontal path by a force of 30 N acting at an angle of 30 degree above the horizontal. The work done (in joules) by the force is:

A. 1500

B. 150

C. $1500\sqrt{2}$

D. $150\sqrt{3}$

E. $1500\sqrt{3}$

5. Let $\boldsymbol{a} =< -2, -1, 2 >$ and $\boldsymbol{b} =< 1, 3, 2 >$. What is $\boldsymbol{a} \times \boldsymbol{b}$?

A. -1

B. $< -4, -6, 5 >$

C. $< -8, 6, -5 >$

D. $< 8, -6, 5 >$

E. $< -8, 3, -5 >$

6. The area of the region bounded by the curves $y = x^2$ and $y = 3x - 2x^2$ is:

A. 1

B. $\frac{9}{10}$

C. $\frac{3}{5}$

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

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

7. Find the volume of a solid whose base is the triangular region with vertices $(0,0)$, $(0,1)$, and $(1,0)$ and slices of the solid perpendicular to the base are squares.

A. $\frac{3}{2}$
B. $\frac{1}{3}$
C. $\frac{2}{3}$
D. $\frac{1}{2}$
E. 1

8. If the method of washers is used to find the volume of a solid obtained by revolving the triangular region with vertices $(0,0)$, $(0,1)$, and $(1,1)$ about the $x-$axis, the integral that represents the volume of this solid is

A. $\pi \int_0^1 (1-x^2)\, dx$
B. $\pi \int_0^1 (1-x)^2\, dx$
C. $\pi \int_0^1 x^2\, dx$
D. $\pi \int_0^1 (y^2-1)\, dy$
E. $\pi \int_0^1 y^2\, dy$

9. If the method of cylindrical shells is used to find the volume of a solid obtained by revolving the region bounded by $y = \cos x$, $y = \sin x$, and $x = \frac{\pi}{2}$ about the line $x = \frac{\pi}{2}$, then the integral that represents the volume of this solid is

A. $2\pi \displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \left(\frac{\pi}{2} - x\right)(\sin x - \cos x)\, dx$

B. $2\pi \displaystyle\int_{0}^{\frac{\pi}{4}} (x)(\sin x - \cos x)\, dx$

C. $2\pi \displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \left(\frac{\pi}{2} - x\right)(\cos x - \sin x)\, dx$

D. $2\pi \displaystyle\int_{0}^{\frac{\pi}{4}} (x)(\cos x - \sin x)\, dx$

E. $2\pi \displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \left(\frac{\pi}{2} - x\right)(\sin^2 x - \cos^2 x)\, dx$

10. If the method of washers is used, the volume of a solid obtained by revolving a certain region about the $x-$axis is given by

$$\pi \int_0^1 (x - x^4)\, dx$$

What integral below represents the same volume if the method of cylindrical shells is used?

A. $2\pi \displaystyle\int_0^1 (y)(\sqrt{y} - y^2)\, dy$

B. $2\pi \displaystyle\int_0^1 (y)(y^2 - \sqrt{y})\, dy$

C. $2\pi \displaystyle\int_0^1 (x)(x - x^4)\, dx$

D. $2\pi \displaystyle\int_0^1 (x)(x^4 - x)\, dx$

E. $2\pi \displaystyle\int_0^1 (y)(\sqrt[4]{y} - y)\, dy$

11. A certain curve passes through the points $(0, 0)$ and $(3, 9)$. If we know the line tangent to the curve always has a slope of x^2, then the length of the curve between $(0, 0)$ and $(3, 9)$ is given by

A. $\displaystyle\int_0^3 \sqrt{1 + 4x}\, dx$

B. $\displaystyle\int_0^9 \sqrt{1 + y}\, dy$

C. $\displaystyle\int_0^3 \sqrt{1 + x^4}\, dx$

D. $\displaystyle\int_0^9 \sqrt{1 + 9y}\, dy$

E. $\displaystyle\int_0^3 \sqrt{1 + x^2}\, dx$

12. Suppose a force of 40N is required to stretch and hold a spring 0.1m from its equilibrium position. By how much (in m) should the spring be compressed from its equilibrium to result in a work of 32J?

A. $\frac{1}{5}$

B. $\frac{2}{5}$

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

D. $\frac{4}{5}$

E. 1