Practice Exam 4

Name: ______________________ Section and/or TA: ____________

Last Four Digits of Student ID: ________

Do not remove this answer page — you will return the whole exam. You will be allowed two hours to complete this test. No books or notes may be used except for a one-page sheet of formulas and facts. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of 10 multiple choice questions and 4 free response questions. Record your answers to the multiple choice questions on this page by filling in the circle corresponding to the correct answer.

Show all work to receive full credit on the free response problems. Please give exact rather than numerical answers ($\sqrt{2}$, not 1.414). Unsupported answers on free response problems will receive *no credit*.

Multiple Choice Questions

1 A B C D E **6** A B C D E

2 A B C D E **7** A B C D E

3 A B C D E **8** A B C D E

4 A B C D E **9** A B C D E

5 A B C D E **10** A B C D E

SCORE

Multiple Choice	11	12	13	14	Total Score
50	10	15	10	15	100

Multiple Choice Questions

1. If $\mathbf{v} = \langle 1, 0, -1\rangle$, $\mathbf{w} = \langle 1, 2, 3\rangle$, and $\mathbf{p} = \langle 0, 2, 1\rangle$, then $(\mathbf{v} \times \mathbf{w}) - 3\mathbf{p}$ is

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

   B. $\langle 2, -6, 1\rangle$

   C. $\langle 2, -4, 2\rangle$

   D. $\langle 2, -2, -1\rangle$

   E. $\langle 2, -10, -1\rangle$

2. Find the equation of the line through $(2, 1, 0)$ and perpendicular to the vectors $\mathbf{i} + \mathbf{j}$ and $\mathbf{j} + \mathbf{k}$.

   A. $\mathbf{r}(t) = \langle 2 - t, 1 + 2t, t\rangle$

   B. $\mathbf{r}(t) = \langle 2 + t, 1 - t, t\rangle$

   C. $\mathbf{r}(t) = \langle 2 + t, 1 + t, 0\rangle$

   D. $\mathbf{r}(t) = \langle 2, 1 + t, 1 + 2t\rangle$

   E. $\mathbf{r}(t) = \langle 2 + t, 1, -t\rangle$

3. The tangent line to the space curve $\mathbf{r}(t) = \langle t, t^2, t^3\rangle$ at $t = 1$ meets the xy plane at the point:

   A. $(1, 2, 3)$

   B. $(2/3, -1/3, 0)$

   C. $(-2/3, 1/3, 0)$

   D. $(0, 0, 0)$

   E. $(2/3, 1/3, 0)$

4. Let $\mathbf{F} = \langle xy^2,\, yz,\, zx^2 \rangle$. Then curl $(\mathbf{F})$ is equal to:

   A. $\langle x^2 - 2\,zx, -2\,xy + y, z^2 - z \rangle$

   B. $-y - x^2 - z^2$

   C. $\langle -y, -2xz, -2xy \rangle$

   D. $x^2 - 2zx - 2xy + y + z^2 - z$

   E. $\langle 2xy, z, 2zx \rangle$

5. The surface $xyz + y^2 + 4z = 6$ has a normal line L at $P = (1, 1, 1)$. Then L meets the xy plane at point Q which is:

   A. $(4/5, 2/5, 0)$

   B. $(4, 2, 0)$

   C. $(-4, 2, 0)$

   D. $(-4/5, 2/5, 0)$

   E. $(4, -2, 0)$

6. The integral $\int_0^1 \int_0^x \int_0^y (6xy + 4yz)\, dz\, dy\, dx$ is equal to:

   A. $19/30$

   B. $7/30$

   C. 1

   D. $1/2$

   E. None of the above

7. Let $x(u,v) = u^2 + uv$ and $y(u,v) = uv^2$. Then the Jacobian determinant

$$J = \left| \begin{pmatrix} \dfrac{\partial x}{\partial u} & \dfrac{\partial x}{\partial v} \\ \dfrac{\partial y}{\partial u} & \dfrac{\partial y}{\partial v} \end{pmatrix} \right|$$

is:

   A. $u^2v + 4uv^2$
   B. $2u^2v + 2uv^2$
   C. $4u^2v + uv^2$
   D. $4u^2v$
   E. $4uv^2$

8. Find $\int_C xy^4\, ds$ if C is the right half of the circle $x^2 + y^2 = 4$.

   A. $128/5$
   B. $64/5$
   C. $32/5$
   D. $64\pi/5$
   E. $32\pi/5$

9. Find a scalar function f so that $\mathbf{F} = \nabla f$ if

$$\mathbf{F}(x,y,z) = yz\mathbf{i} + xz\mathbf{j} + (xy + 2z)\mathbf{k}.$$

   A. $f(x,y,z) = xyz + \frac{1}{2}z^2$
   B. $f(x,y,z) = xyz$
   C. $f(x,y,z) = xyz + z^2$
   D. $f(x,y,z) = xy + z^2$
   E. There is no such scalar function

10. Let $\mathbf{F}$ denote a vector field and let f define a scalar function of three variables. Which of the following expression *is* a meaningful expression?

   A. div (grad f)
   B. div (div $\mathbf{F}$).
   C. curl (div $\mathbf{F}$)
   D. grad (grad $\mathbf{F}$)
   E. grad (grad f)