NAME ______________________________

STUDENT ID # ______________________________

INSTRUCTOR ______________________________

INSTRUCTIONS

1. There are 6 different test pages (including this cover page). Make sure you have a complete test.
2. Fill in the above items in print. I.D.# is your 9 digit ID (probably your social security number). Also write your name at the top of pages 2–6.
3. Do any necessary work for each problem on the space provided or on the back of the pages of this test booklet. You need to show your work. Circle your answers in this test booklet for the first 10 questions.
4. No books, notes or calculators may be used on this exam.
5. Each problem is worth 10 points. The maximum possible score is 100 points.
6. Using a #2 pencil, fill in each of the following items on your answer sheet:
   (a) On the top left side, write your name (last name, first name), and fill in the little circles.
   (b) On the bottom left side, under SECTION, write in your division and section number and fill in the little circles. (For example, for division 9 section 1, write 0901. For example, for division 38 section 2, write 3802).
   (c) On the bottom, under STUDENT IDENTIFICATION NUMBER, write in your student ID number, and fill in the little circles.
   (d) Using a #2 pencil, put your answers to questions 1–10 on your answer sheet by filling in the circle of the letter of your response. Double check that you have filled in the circles you intended. If more than one circle is filled in for any question, your response will be considered incorrect. Use a #2 pencil.
   (e) Sign your answer sheet.
7. After you have finished the exam, hand in your answer sheet and your test booklet to your instructor.

1. Determine a so that the line

$$\frac{x-3}{a} = \frac{y+5}{2} = \frac{z+1}{4}$$

is parallel to the plane $2x + 3y - 5z = 14$.

A. $a = -4$

B. $a = 3$

C. $a = -14$

D. $a = -5$

E. $a = 7$

2. The line through $(3, 2, 1)$ and $(5, 1, 2)$ intersects the plane $x + y + z = 14$ at the point

A. $(11, -2, 5)$

B. $(8, 4, 2)$

C. $(15, 0, -1)$

D. $(10, -1, 5)$

E. $(9, -3, 8)$

3. The vector-valued function $\vec{r}(t) = \vec{i} + (t\cos t)\vec{j} + (t\sin t)\vec{k}$, $0 \le t < \infty$ describes a

A. circle in a horizontal plane

B. circle in a vertical plane

C. spiral in a horizontal plane

D. spiral in a vertical plane

E. ellipse in a vertical plane

4. In spherical coordinates the two equations $\rho = 2$, $\phi = \pi/6$ describe

A. a cone

B. a circle

C. a plane

D. a sphere

E. a cylinder

5. The curves $\vec{r}_1(t) = \langle t, t^2, 1\rangle$ and $\vec{r}_2(t) = \langle \sin t, \sin 2t, 1\rangle$ intersect at $(0,0,1)$ at an angle θ, where $\cos\theta =$

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

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

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

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

E. $\frac{1}{\sqrt{6}}$

6. The level surfaces of the function $f(x,y,z) = x - y^2 - z^2$ are

A. ellipsoids

B cones

C. cylinders

D. elliptic paraboloids

E. hyperbolic paraboloids

7. Let $f(x,y) = e^{xy}\sin(x^2)$. Then $\frac{\partial^2 f}{\partial x \partial y}(\sqrt{\pi}, 0) =$

A. -2π

B. $-2\sqrt{\pi}$

C. 0

D. π

E. $\sqrt{2\pi}$

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

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

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

C. $\sqrt{3}$

D. 1

E. $\sqrt{5}$

9. A particle has acceleration $\vec{a}(t) = 6t\vec{j} + 2\vec{k}$. The initial position is $\vec{r}(0) = \vec{j}$ and the initial velocity is $\vec{v}(0) = \vec{i} - \vec{j}$. The distance from the position of the particle at time $t = 1$ to the point $(2, 2, 3)$ is

A. 3

B. $\sqrt{7}$

C. $\sqrt{6}$

D. 4

E. 2

10. The curvature of the curve defined by the intersection of the cylinder $x^2 + y^2 = 1$ with the plane $y + z = 2$ at $(0, 1, 1)$ is

(*you may use the formula* $\kappa = \frac{|\vec{r}\,'(t) \times \vec{r}\,''(t)|}{|\vec{r}\,'(t)|^3}$)

A. 1

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

C. $\sqrt{2}$

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

E. 2