Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

Page	**Max. points**	**Your points**
2	30	
3	25	
4	25	
5	20	
Total	100	

Problem 1 (15 pts)**.** Find the distance d from the point $(3, 7, -5)$ to the z–axis.

$d =$ ☐

Problem 2 (15 pts)**.** Find an exact expression for the angle θ between the vectors $\boldsymbol{v} = \langle 3, -1, 5\rangle$ and $\boldsymbol{w} = \langle -2, 4, 3\rangle$.

$\theta =$ ☐

Problem 3 (15 pts)**.** Find the length ℓ of the curve $\boldsymbol{r}(t) = \boldsymbol{i} + t^2\boldsymbol{j} + t^3\boldsymbol{k}$ for $0 \le t \le 1$.

$\ell =$ ____

Problem 4 (10 pts)**.** At what points does the helix $\boldsymbol{r}(t) = \langle \sin t, \cos t, t \rangle$ intersect the sphere $x^2 + y^2 + z^2 = 5$?

points: ____

Problem 5 (15 pts)**.** Find a unit vector $\boldsymbol{v}$ that is orthogonal to both $\boldsymbol{i}+\boldsymbol{j}$ and $\boldsymbol{i}+\boldsymbol{k}$.

$\boldsymbol{v} =$ ☐

Problem 6 (10 pts)**.** Determine whether the points $A=(0,-5,5)$, $B=(1,-2,4)$ and $C=(3,4,2)$ lie on a straight line.

Problem 7 (20 pts)**.** Find parametric equations for the line of intersections of the planes $x+y+z=1$ and $x+2y+2z=1$. Find the angle θ between the two planes.

$\theta =$