MA225C Mock Test 1

Name: _________________________________

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

1) The vector \((1,5, 2,5, 2,5)\) is a unit vector. 1) ______

2) Two vectors \(\vec{v}\) and \(\vec{w}\) are parallel if \(\vec{v} \cdot \vec{w} = 0\). 2) ______

3) The surface \(z =x^2+y^2\) is an ellipsoid. 3) ______

4) If two planes \(ax +by +cz=d\) and \(Ax +By +Cz =D\) are parallel, then \(a =A, b =B,\) and \(c =C\). 4) ______

5) Every point on the parametric curve \(r(t) = (t, t^2, -t)\) lies on the surface \(xz+y=0\). 5) ______

6) \(\text{Proj}_u \vec{v} = \text{Proj}_v \vec{u}\) for all vectors \(\vec{u}\) and \(\vec{v}\). 6) ______

7) The curvature of the curves \(r(t) = (t, t^2, t^3)\) and \(R(t) = (t^2, t^4, t^6)\) are the same at \(t=1\). 7) ______

8) The volume of the parallelepiped spanned by the vectors \((1,0,0)\), \((0,2,0)\) and \((1,1,1)\) is 2. 8) ______

9) The vector \((-5,4,1)\) is parallel to the plane \(-5x +4y +z =2\). 9) ______

10) There are vectors \(\vec{u}\) and \(\vec{v}\) such that \(\vec{u} \cdot \vec{v} = \|\vec{u} \times \vec{v}\|\). 10) ______

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The position vector of a particle is \(r(t)\). Find the requested vector.

11) The velocity at \(t = 1\) for \(r(t) = (2 - 4t^2)i + (6t +5)j - e^{-6t}k\)

A) \(v(1) = 8i +6j + 6e^{-6}k\)  B) \(v(1) = -8i +6j + 6e^{-6}k\)
C) \(v(1) = -4i +6j + 6e^{-6}k\)  D) \(v(1) = -8i +6j - 6e^{-6}k\)

12) The acceleration at \(t = 1\) for \(r(t) = (3t - 2t^4)i + (2- t)j + (6t^2 - 7)k\)

A) \(a(1) = 24i +12k\)  B) \(a(1) = -6i +12k\)
C) \(a(1) = -24i - j +12k\)  D) \(a(1) = -24i +12k\)

For the smooth curve \(r(t)\), find the parametric equations for the line that is tangent to \(r\) at the given parameter value \(t = t_0\).

13) \(r(t) = (6 \sin t)i - (9 \cos 3t)j + e^{-10t}k; t_0 = 0\)

A) \(x = 6t, y = -9, z =1 - 10t\)  B) \(x = 6t, y = 9, z = 1 + t\)
C) \(x = 6, y = -9t, z = -10 + t\)  D) \(x = 6t, y = -9, z = 1 - t\)
Find the arc length parameter along the curve from the point where }t=0\text{ by evaluating }s = \int_0^t |v(\tau)| \, d\tau.

14) }r(t) = (4\cos t)i + (4\sin t)j + 5tk

A) }\sqrt{57}t\quad B) }\sqrt{66}t\quad C) }\frac{\sqrt{41}}{2}t\quad D) }\sqrt{41}t

SHORT QUESTIONS.

15) Parametrize the following surfaces.
   a) }x^2 + y^2 = z^2 + 1.
   b) }x^2 + 2y^2 + 4z^2 = 4.
   c) }z = e^y (\sin x).
   d) }x + y + z = 4.