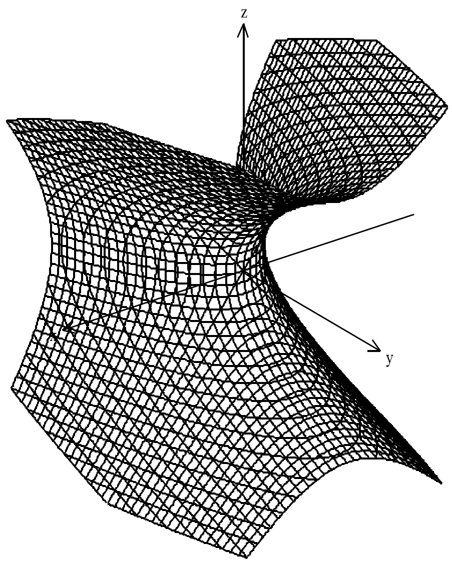
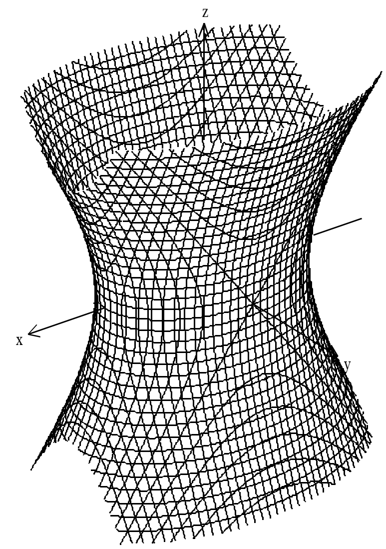
MATH 2415	Calculus III SI Session	09/23/11
SI: Neil Jody		Professor: George Stockton
Wednesdays Rm 1245		03:00 PM - 05:00 PM and 05:00 PM - 07:00 PM

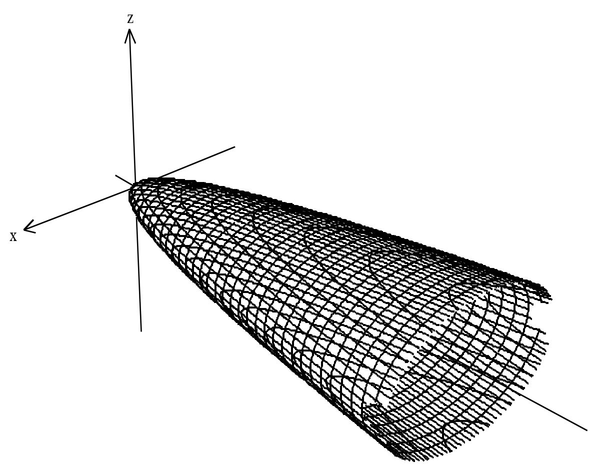
1. Sketch the cylinder given by the equation $z = 4 - x^2$
2. Let $\mathbf{u} = (1, 3, -4)$ and $\mathbf{v} = (2, -2, 1)$
(a) $\text{proj}_{\mathbf{u}}\, \mathbf{v}$ (b) Calculate $\mathbf{u} \times \mathbf{v}$ (c) Calculate $(2\mathbf{u} - 3\mathbf{v}) \cdot (\mathbf{u} + 4\mathbf{v})$
(d) Calculate the area of the parallelogram with adjacent sides $\mathbf{u}$ and $\mathbf{v}$.
(e) Find the vector that has the direction of $\mathbf{u}$ and the length of $\mathbf{v}$
(f) Determine the value of c so that the vector $\langle c, 1, -2\rangle$ lies in the plane of $\mathbf{u}$ and $\mathbf{v}$.
3. To the nearest tenth of a degree, find the angle between the planes $x - y + 5z = 1$ and $-x + 3y - z = 2$.
4. find the equation of the plane containing the points $(1, 0, 2)$, $(3, -2, -1)$, and $(2, 1, 1)$.
5. Find the length of the curve generated by $\mathbf{r}(t) = (2t, t^2, \frac{1}{3}t^3)$ where $0 \le t \le 3$.
6. Find the parametric equations of the line tangent to the curve generated by $\mathbf{r}(t) = (\mathrm{e}^{t-2}, t^2 - 1, \sqrt{t+2})$ at the point $(1, 3, 2)$.
7. Find the distance from the point $(-4, 1, 3)$ to the plane $2x - y + 3z = 6$.
8. Find $\mathbf{r}(t)$ if $\mathbf{r}'(t) = (2t - 2, \sin t, \mathrm{e}^t)$ and $\mathbf{r}(0) = (3, 1, -3)$
9. The position of a particle at time t is given by the function $\mathbf{r}(t) = (\sin t, t^2 + 4t, -\cos t)$
(a) At what time(s), if any, is the speed of the particle equal to 2?
(b) At what time(s), if any, will the velocity and acceleration vectors be orthogonal?
10. Evaluate the following limit: $\lim_{t\to 2}(t^2\hat{i} - \frac{1}{t}\hat{j} + \cos(t-2)\hat{k})$.
11. Determine if the point (-1,2,6) lies on the line given by the parametric equations $x = -2 + 3t$, $y = 6t$, $z = 3 - 2t$.
12. Find the values of a and b so that $\mathbf{u} = (2, -1, -5)$ and $\mathbf{v} = (a, b, -1)$ are parallel.
13. A particle is moving along the line containing the point $(1, 1, 2)$ with direction vector $\langle -1, 2, 1\rangle$ at a speed of 4 units per second. The particle intersects the paraboloid $z = x^2 + y^2$ in exactly two points, P_1 and P_2. How long does it take the particle to travel the distance between P_1 and P_2?
14. Find $\mathbf{T}(t)$, $\mathbf{N}(t)$, $a_{\mathbf{T}}$ and $a_{\mathbf{N}}$ at tthe given time t for the curve.
(a) $\mathbf{r}(t) = (\mathrm{e}^t, \mathrm{e}^{-t}, t)$, $t = 0$
(b) $\mathbf{r}(t) = (\mathrm{e}^t \sin t, \mathrm{e}^t \cos t, \mathrm{e}^t)$, $t = 0$
15. Find the curvature κ of the curve.
(a) $\mathbf{r}(t) = (4t, 3\cos t, 3\sin t)$
(b) $\mathbf{r}(t) = (\mathrm{e}^t \cos t, \mathrm{e}^t \sin t, \mathrm{e}^t)$
16. Match each equation to its graph on the following page:
(1) $y = x^2 + 4z^2$
(2) $-4x^2 + y^2 + 4z^2 = 0$
(3) $y = -x^2 + z^2$
(4) $4x^2 + 9y^2 - 4z^2 = 36$



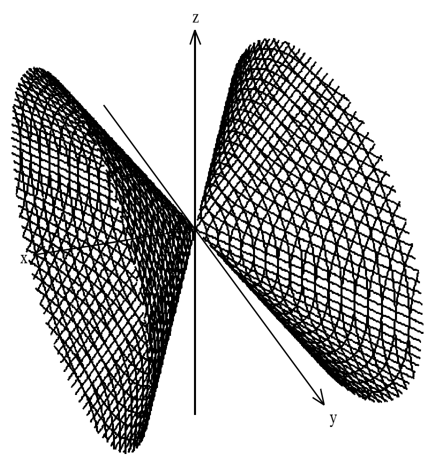
(A)



(B)



(C)



(D)