Wed, Sep 25, 2013 **MATH 250, Quiz 3** Prof. V. Panferov

Name (print): *Solutions.*

Each problem is worth 2 points. Show all your work.

1. Find an equation of the plane through the point $P(1,-1,-1)$ and parallel to the plane $5x - y - z = 6$. *Express your answer in the form $Ax + By + Cz + D = 0$.*

$\vec{n} = (5, -1, -1)$

$\vec{r}_0 = (1, -1, -1)$

Equation: $\vec{n} \cdot (\vec{r} - \vec{r}_0) = 0$

$$5(x-1) - (y+1) - (z+1) = 0$$

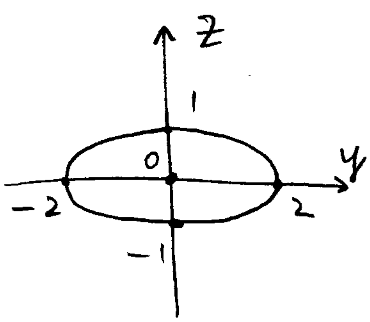
$$5x - y - z - 7 = 0.$$

2. Use "traces" ("sections") by the planes $x = \pm 2$, $y = 0$ and $z = 0$ to determine the type of the quadric surface $x^2 = y^2 + 4z^2$, and then sketch it.

$\boxed{x = \pm 2}$:

$y^2 + 4z^2 = 4$

$\frac{y^2}{4} + z^2 = 1$

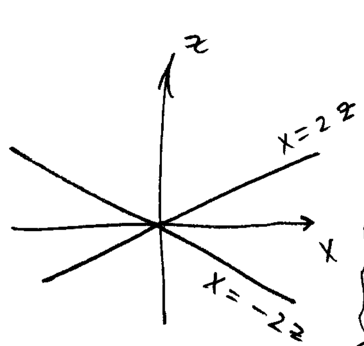


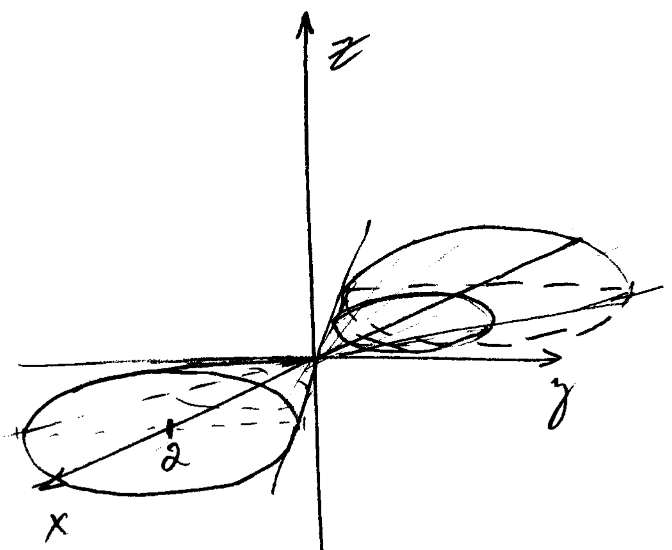
$\boxed{y = 0}$:

$x^2 - 4z^2 = 0$

$x^2 = 4z^2$

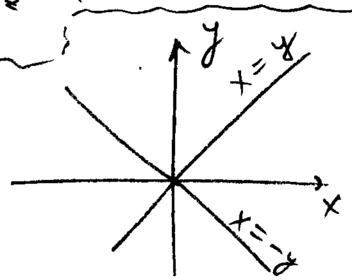
$x = \pm 2z$





The surface is a(n) (elliptic) cone.

$\boxed{z = 0} \Rightarrow$ $x^2 = y^2$, $x = \pm y$



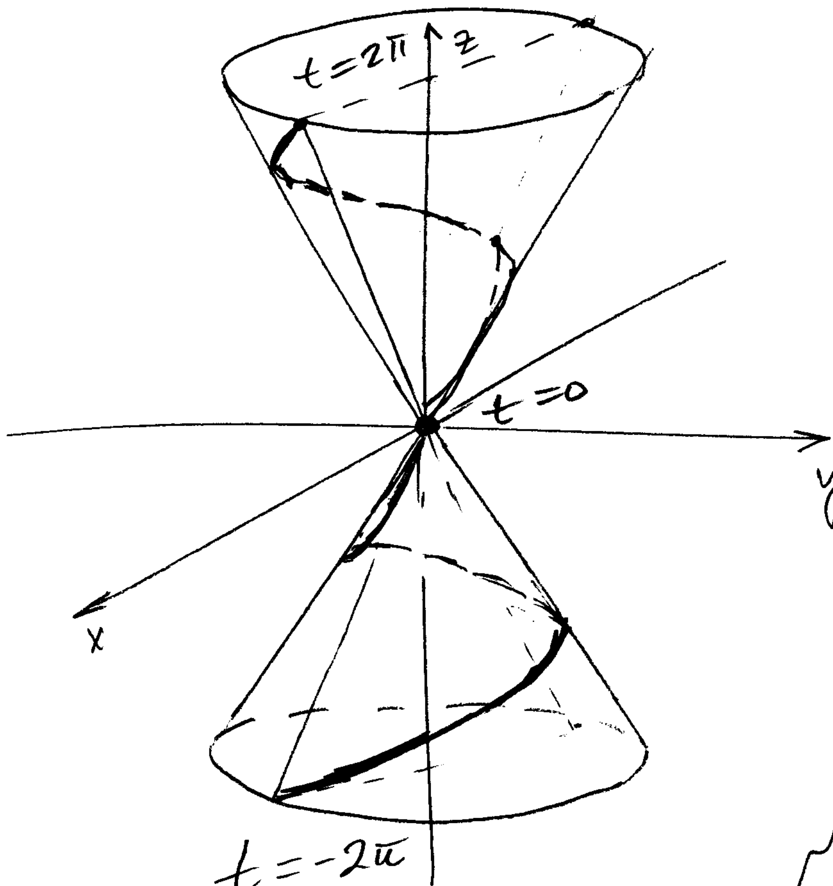
$\left(\frac{x^2}{a^2} - \frac{y^2}{b^2} - \frac{z^2}{c^2} = 0 \right)$

Please turn over...

3. Show that the curve with parametric equations $x = t\cos t$, $y = t\sin t$, $z = t$ lies on the cone $z^2 = x^2 + y^2$ and use this fact to sketch the curve.

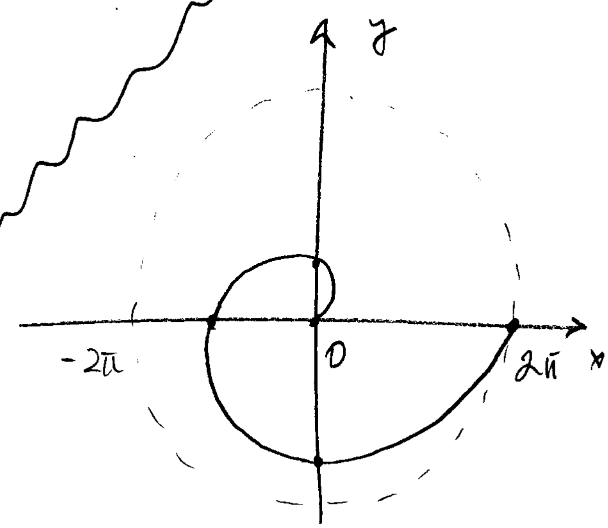
$$x^2 + y^2 = (t\cos t)^2 + (t\sin t)^2 = t^2\cos^2 t + t^2\sin^2 t$$
$$= t^2(\cos^2 t + \sin^2 t) = t^2 = z^2.$$

(This holds for every t => for every point on the curve.)



Sketch:

Cone $z^2 = x^2 + y^2$



For $0 \le t \le 2\pi$, projection onto xy-plane