space curves

(19) $x = \cos 4t, \quad y = t, \quad z = \sin 4t$

All the points (x, y, z) on the curve satisfy

$$x^2 + z^2 = 1$$

So curve is on a cylinder (with axis the y-axis).

On the curve $y = t$,

hence the curve is a helix. VI

(20) $x = t, \quad y = t^2, \quad z = e^{-t}$

All the pts (x, y, z) on the curve satisfy

$y = x^2$. Also note that $y \geq 0$ & $z \geq 0$

& $(0,0,1)$ is on the curve (if $t = 0$)

As $t \to \infty$, $(x, y, z) \to (\infty, \infty, 0)$ &

as $t \to -\infty$, $(x, y, z) \to (-\infty, \infty, \infty)$

So curve II

(21) $x = t, \quad y = \frac{1}{1+t^2}, \quad z = t^2$

$y, z \geq 0$

the curve passes thr $(0,1,0)$ (when $t=0$).

As $t \to \infty$, $(x,y,z) \to (\infty, 0, \infty)$

as $t \to -\infty$ $(x,y,z) \to (-\infty, 0, \infty)$

So the curve IV

(22) $x = e^{-t}\cos 10t, \quad y = e^{-t}\sin 10t, \quad z = e^{-t}$

$x^2+y^2 = e^{-2t}(\cos^2 10t + \sin^2 10t) = e^{-2t} = z^2$

Hence the curve is on the cone

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

$z > 0$ & hence the curve I

(23) $x = \cos t, \quad y = \sin t, \quad z = \sin 5t.$

$x^2+y^2 = \cos^2 t + \sin^2 t = 1$

Hence the curve is on a cylinder with

z axis ~~[illegible]~~ as its axis.

$r(t) = r(t+2\pi)$

& hence curve V

24 $x = \cos t, \quad y = \sin t, \quad z = \ln t.$

$$x^2 + y^2 = \cos^2 t + \sin^2 t = 1$$

curve is on a cylinder with axis the z-axis.

As $t \to 0, \quad z \longrightarrow -\infty$

& hence III