2. The component functions $\frac{t-2}{t+2}$, $\sin t$, and $\ln(9-t^2)$ are all defined when $t\neq-2$ and $9-t^2>0\Rightarrow$ $-3<t<3$, so the domain of $\boldsymbol{r}(t)$ is $(-3,-2)\cup(-2,3)$.

6. $\lim_{t\to\infty}\arctan t=\frac{\pi}{2}$, $\lim_{t\to\infty}e^{-2t}=0$, $\lim_{t\to\infty}\frac{\ln t}{t}=\lim_{t\to\infty}\frac{1/t}{1}=0$ [by l'Hospital's Rule].
Thus $\lim_{t\to\infty}\left\langle \arctan t, e^{-2t}, \frac{\ln t}{t}\right\rangle=\left\langle\frac{\pi}{2},0,0\right\rangle$.

18. Taking $\boldsymbol{r}_0=\langle-2,4,0\rangle$ and $\boldsymbol{r}_1=\langle 6,-1,2\rangle$, we have $\boldsymbol{r}(t)=(1-t)\boldsymbol{r}_0+t\boldsymbol{r}_1=(1-t)\langle-2,4,0\rangle+t\langle 6,-1,2\rangle$, $0\leq t\leq 1$ or $\boldsymbol{r}(t)=\langle-2+8t,4-5t,2t\rangle$, $0\leq t\leq 1$. Parametric equations are $x=-2+8t$, $y=4-5t$, $z=2t$, $0\leq t\leq 1$.

33. If $t=-1$, then $x=1, y=4, z=0$, so the curve passes through the point $(1,4,0)$. If $t=3$, then $x=9, y=-8, z=28$, so the curve passes through the point $(9,-8,28)$. For the point $(4,7,-6)$ to be on the curve, we require $y=1-3t=7\Rightarrow t=-2$. But then $z=1+(-2)^3=-7\neq-6$, so $(4,7,-6)$ is not on the curve.