5. What are the equations of the line tangent to the curve which is parameterized by $\vec{r}(t) = (3t^3 + 2)\,\vec{i} + 6t^2\,\vec{j} + (4t^3 + 2t)\,\vec{k}$ at $t = 1$?

$\vec{r}(1)$ is $5\vec{i} + 6\vec{j} + 6\vec{k}$ so it is $(5, 6, 6)$

$\vec{r}'(t)$ is $9t^2\vec{i} + 12t\vec{j} + (12t^2 + 2)\vec{k}$

$\vec{r}'(1) = 9\vec{i} + 12\vec{j} + 14\vec{k}$

The tangent line is

$x = 5 + 9t$

$y = 6 + 12t$

$z = 6 + 14t$

6. Find the equation of the plane tangent to the surface $z = x^2 + 3y^3$ at the point where $x = 2$ and $y = -2$.

point $= 4 + 3(-8) = 4 - 24 = -20$

's are $\perp$ level sets $0 = x^2 + 3y^3 - z$

$\nabla f(1) = 2x\vec{i} + 9y^2\vec{j} - \vec{k}$

$\nabla f|_H = 4\vec{i} + 36\vec{j} - \vec{k}$

$4(x-2) + 36(y+2) - (z+20) = 0$