Name: **ID:** .

1.

a) Determine the equation of a plane that passes through the point $(3, -2, 3)$ and the line $\mathbf{r}(t) = \langle 1, 2, 2\rangle + t\langle -1, 4, 2\rangle$.

b) Determine the equation of the plane parallel to the one you just found, but passing through the origin.

2. Determine a function $\mathbf{r}(t)$ that traces a circle of radius 3 centered at the point $(0, 3)$. The circle should be traced out clockwise and should go around once for $0 \leq t \leq \pi$. Note the upper end for t in this range!

3.

a) A bug wanders in the plane with a path $\mathbf{r}(t) = \left\langle t^3, t \right\rangle$ cm with time $-1 \leq t \leq 1$ seconds. Sketch the path of the bug below, being careful to show correct behavior at time $t = 0$.

b) Compute the displacement vector from $t = -1$ to $t = 1$ and add it to your diagram. Units please.

c) Compute the average rate of change of position with respect to time from $t = -1$ to $t = 1$ seconds. Include units in your answer.