HW 2
Math 261

Please see the course syllabus for details on how to turn in your homework assignments.

1. (5 pts.) TRUE OR FALSE
(a) A line and a plane in $\mathbb{R}^3$ always intersect in a point.
(b) A line and a plane in $\mathbb{R}^3$ intersect in at most one point.
(c) A plane $P$ in $\mathbb{R}^3$ and a line in $\mathbb{R}^3$ not completely contained in $P$ intersect in at most one point.
(d) $\mathbf{r}_1(t) = \langle t, 2t, 3t \rangle$ and $\mathbf{r}_2(t) = \langle 1 - t, 2 - 2t, 3 - 3t \rangle$ are two parameterizations of the same line.
(e) $\mathbf{r}_1(t) = \langle t, 0, 0 \rangle$ and $\mathbf{r}_2(t) = \langle 0, 0, t \rangle$ are two parameterizations of the same line.

2. (3 pts.) Determine the equation of the plane that passes through points $(0, 1, 0)$, $(-1, 0, 1)$, and $(0, -2, 1)$. Please give your answer in the form

\[ \square x + \square y + \square z = 1. \]

3. (3 pts.) Fill in the blanks of the following parameterization of a line through the points $P_1 = (1, 1, 0)$ and $P_2 = (0, 3, 1)$:

\[
\begin{cases}
  x = -1 + t \\
  y = \square + \square t \\
  z = \square + \square t
\end{cases}
\]

4. (3 pts.) The line given by the parameterization

\[
\begin{cases}
  x = 1 + t \\
  y = 3t \\
  z = 2 - 2t
\end{cases}
\]

and the plane given by $x + 2y + z = 8$ intersect in a point. Find that point.

5. (3 pts.) Compute the derivative $\mathbf{r}'(t)$ of vector function $\mathbf{r}(t) = \langle e^t, 3t^2 - 2t + 5, \sin(t) \rangle$.

6. (3 pts.) Suppose a particle moves according to the position function $\mathbf{r}(t) = \langle t^3, t^2, 4t + 1 \rangle$. Determine the acceleration $\mathbf{a}(2)$ of the particle at $t = 2$. 