4.1

4.1 The velocity field of a flow is given by $V = (5z - 3)\hat{\mathbf{i}} + (x + 4)\hat{\mathbf{j}} + 4y\hat{\mathbf{k}}$ ft/s, where x, y, and z are in feet. Determine the fluid speed at the origin ($x = y = z = 0$) and on the x axis ($y = z = 0$).

$u = 5z - 3$, $v = x + 4$, $w = 4y$

Thus, at the origin $u = -3$, $v = 4$, $w = 0$

so that

$V = \sqrt{u^2 + v^2 + w^2} = \sqrt{(-3)^2 + 4^2} = \underline{\underline{5 \text{ ft/s}}}$

Similarly, on the x axis $u = -3$, $v = x + 4$, $w = 0$

so that

$V = \sqrt{u^2 + v^2 + w^2} = \sqrt{(-3)^2 + (x+4)^2} = \underline{\underline{\sqrt{x^2 + 8x + 25} \text{ ft/s}}}$, where $x \sim$ ft