

$$3. \nabla f = \langle 2x, -4y, 6z \rangle$$

$$\nabla f(2, 3, -1) = \langle 4, -12, -6 \rangle$$

$$\|\nabla f(2, 3, -1)\| = \sqrt{16 + 144 + 36} = \sqrt{196}$$

$$= 14 \longleftarrow \text{THIS IS MAXIMUM RATE OF CHANGE}$$

A UNIT VECTOR POINTING IN THE DIRECTION OF MAXIMUM INCREASE IS

$$\frac{\nabla f(2, 3, -1)}{\|\nabla f(2, 3, -1)\|} = \left\langle \frac{2}{7}, -\frac{6}{7}, -\frac{3}{7} \right\rangle$$