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$$1) D_v f(P) = \nabla f_P \cdot \vec{v} = \langle 1, 4, 6 \rangle \cdot \langle 2, -1, -1 \rangle = 2 - 4 + 6 = -8$$

$$\nabla f_P = \left\langle \frac{d}{dx} f(x,y,z), \frac{d}{dy} f(x,y,z), \frac{d}{dz} f(x,y,z) \right\rangle$$

$$= \langle y^2 z^3, 2xy z^3, 3xy^2 z^2 \rangle$$

$$= \langle 1, 4, 6 \rangle$$

$$2) = \langle 2, 3 \rangle$$

$$\langle 4, 3 \rangle$$

$$\vec{v} = \frac{\langle 4, 3 \rangle}{5}$$

$$||\vec{v}|| = \sqrt{4^2 + 3^2} = 5$$

↑
rate of change