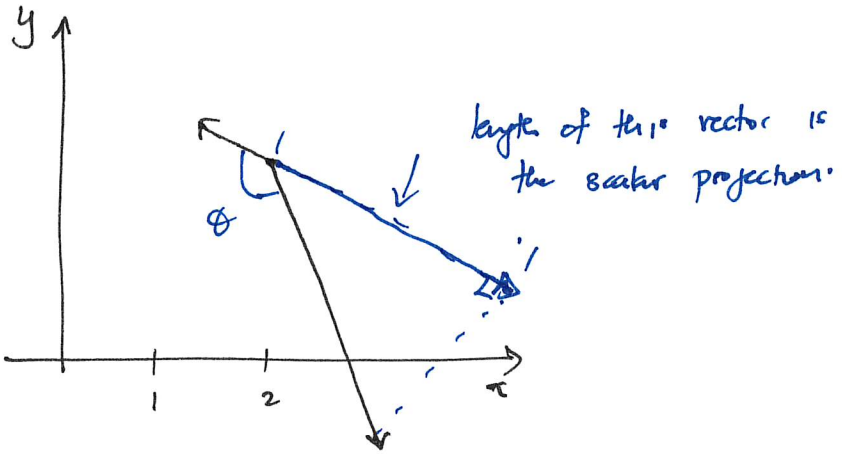
SECTION 14.6 — ANS TO EVEN PROBLEMS

18.

$D_{\vec{u}} f(2,2) = \nabla f(2,2) \cdot \vec{u}$, recall that this is the scalar projection of $\nabla f(2,2)$ onto $\vec{u}$



Since θ is greater than 90°, $D_{\vec{u}} f(2,2) \cdot \vec{u} < 0$ so we can estimate that $D_{\vec{u}} f(2,2) = -3$.

32. (a) $D_{\vec{u}} T(2,-1,2) = \dfrac{-5200}{3e^{43}}$ °C/m.

(b) $\nabla T(2,-2,2) = 400\, e^{-43} \langle -2, 3, -18 \rangle$

(c) $|\nabla T|$ at $(2,-1,2) = 400 e^{-43} \sqrt{337}$ °C/m.

34. (a) Due south $u = -\mathbf{j}$ so

$D_{\vec{u}} f(60,40) = \nabla f(60,40) \cdot \langle 0, -1 \rangle = 0.8$

(b) Northwest $u = \dfrac{1}{\sqrt{2}} \langle 1, 1 \rangle$ so $D_{\vec{u}} f(60,40) = \dfrac{-0.2}{\sqrt{2}}$

(c) $\nabla f(60,40)$ is the direction with a rate given by $|\nabla f(60,40)|$