Answers to Even Exercises, Homework Set 5

Section 11.4# 16 $f_v(40,20)$ is approximately equal to 1.15, and $f_t(40,20)$ is approximately 0.45. The linear approximation to f near $(40,20)$ is then:

$$f(v,t) \approx 28 + 1.15(v-40) + 0.45(t-20)$$

Using this we get $f(43,24) \approx 33.25$ ft.

\# 38 $24x - 14y + 18z = 88$

Section 11.5 #18 $\frac{\partial u}{\partial x}(1,2,0) = \frac{4}{\sqrt{10}}$, $\frac{\partial u}{\partial y}(1,2,0) = \frac{3}{\sqrt{10}}$, $\frac{\partial u}{\partial t} = \frac{2}{\sqrt{10}}$

#40 Since $\frac{\delta z}{\delta s} = \frac{\delta z}{\delta x}\frac{\delta x}{\delta s} + \frac{\delta z}{\delta y}\frac{\delta y}{\delta s} = \frac{\delta z}{\delta x} + \frac{\delta z}{\delta y}$, and since $\frac{\delta z}{\delta t} = \frac{\delta z}{\delta x}\frac{\delta x}{\delta t} + \frac{\delta z}{\delta y}\frac{\delta y}{\delta t} = \frac{\delta z}{\delta x} - \frac{\delta z}{\delta y}$, then:

$$\frac{\delta z}{\delta s}\frac{\delta z}{\delta t} = (\frac{\delta z}{\delta x} + \frac{\delta z}{\delta y})(\frac{\delta z}{\delta x} - \frac{\delta z}{\delta y}) = (\frac{\delta z}{\delta x})^2 + (\frac{\delta z}{\delta y})^2$$

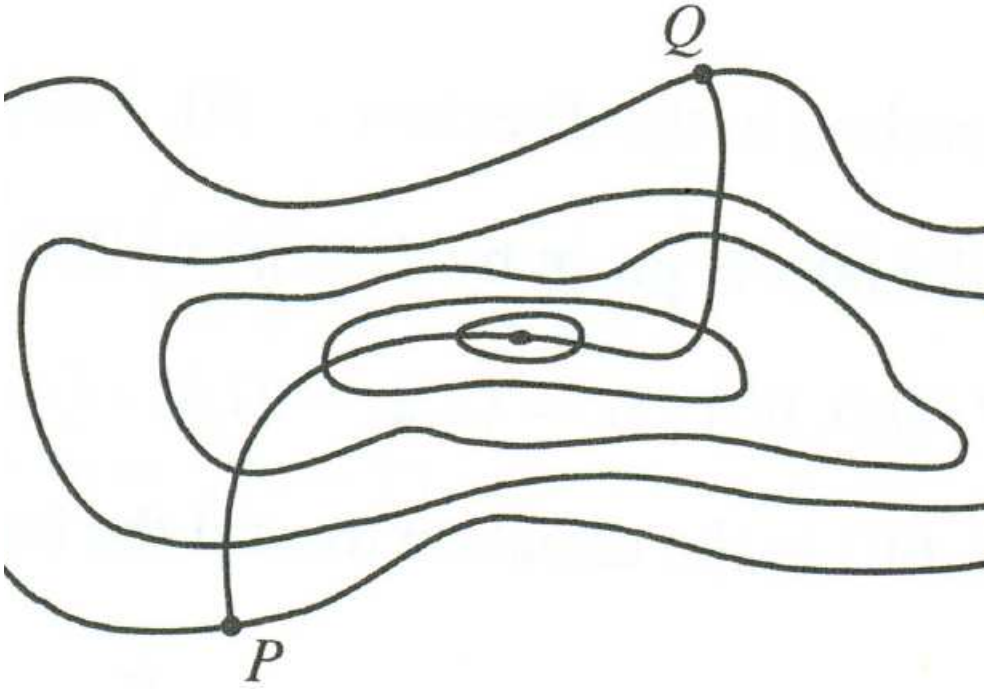
Section 11.6# 26 Since the directional derivative of the depth function in the direction of the boat's travel is 3.92, the depth in increasing in this direction and so the water is becoming deeper as he departs.

\# 30 (a) The direc. deriv. due south is 0.8, so you will ascend at a rate of 0.8 vertical meters per horizontal meter.

(b) going northwest, you will descent at a rate of approx. 0.14 vertical meters per horizontal meter

(c) The angle above the horizontal in which the path begins is given by $\tan\theta = 1$, or $\theta = \pi/4$.

\# 32 The curve of steepest ascent is the path that runs perpindicular to all of the contour lines.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