14.3: 2
15.1: 2, 32, 34
15.2: 18

HOMEWORK 5

14.3:2: Find the length of the curve $\vec{r}(t) = (2t, t^2, t^3/3)$ where $t \in [0,1]$.

$$\int_C ds = \int_0^1 |\vec{r}\,'(t)|\,dt$$

$$= \int_0^1 \sqrt{(2)^2 + (2t)^2 + (t^2)^2}\,dt$$

$$= \int_0^1 \sqrt{4 + 4t^2 + t^4}\,dt$$

$$= \int_0^1 \sqrt{(t^2+2)^2}\,dt$$

$$= \int_0^1 (t^2+2)\,dt$$

$$= \frac{1}{3} + 2 = \frac{7}{3}.$$

<u>15.1:2</u> (uses a table on page 902)

a) $f(95,70) = 124$, this is the temperature humidity index when $T = 95$ & $h = 70$.

b) $f(90,h) = 100$ when $h = 60$.

c) $f(T,50) = 88$ when $T = 85$

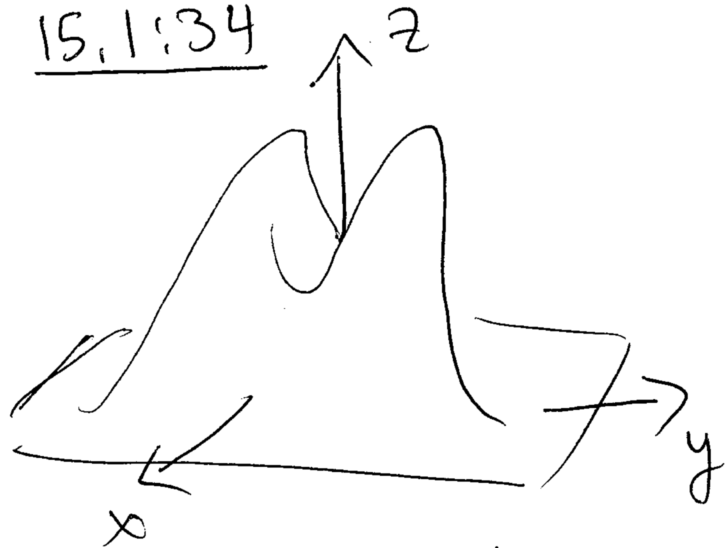
d) when fixing T (the ~~humidity~~ temperature) the function $I(h) := f(T,h)$ is how the index changes for a fixed ~~humidity~~, temp & varying humidity.

The apparent temperature increases more rapidly ~~when~~ with humidity when the actual temperature is high.

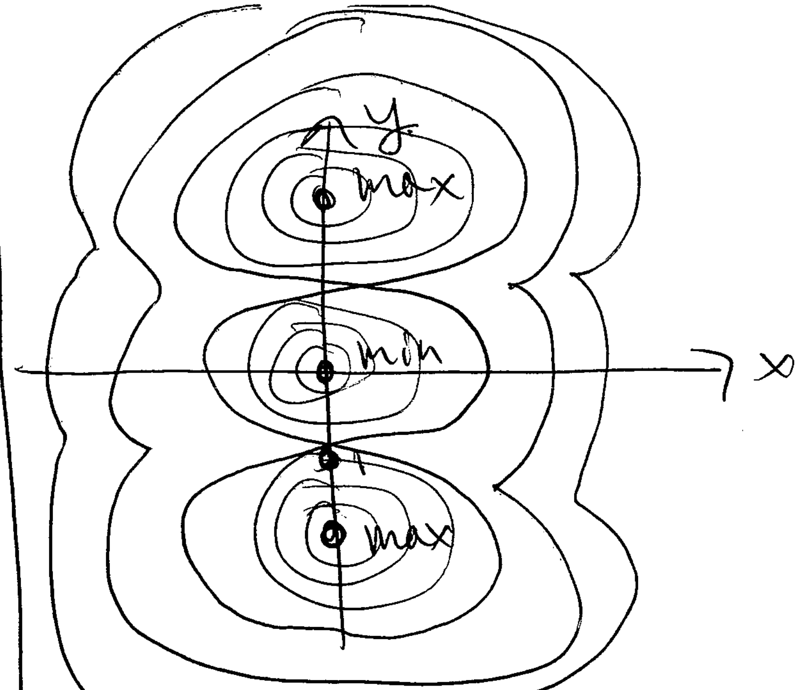
<u>15.1:32</u> (two contour graphs for functions of two variables are shown on page 903)

Assumming the contours are sampled at regular heights then graph II belongs to the cone & graph I belongs to the paraboloid. This is because the levels of the cone increase proportional to the change in the radius; $z = \sqrt{x^2+y^2}$.

15.1:34



graph on page 903.



what the contour plot should look like

15.2:18 Compute $\displaystyle\lim_{(x,y)\to(0,0)} \frac{xy^4}{x^2+y^8}$

- Approach along $x(t) = t^4$, $y(t) = t$ as $t \to 0$.

$$\frac{x(t)\,y(t)^4}{x(t)^2 + y(t)^8} = \frac{t^4 t^4}{(t^4)^2 + t^8} = \frac{t^8}{2t^8} = \frac{1}{2} \to \frac{1}{2} \text{ as } t \to 0.$$

- Approach along $x(t) = t$, $y(t) = t$. as $t \to 0$.

$$\frac{x(t)\,y(t)^4}{x(t)^2 + y(t)^8} = \frac{t \cdot t^4}{t^2 + t^8} = \frac{t^5}{t^2 + t^8} = \frac{t^3}{1 + t^5} \to 0 \text{ as } t \to 0$$

Since we got different values approaching along different curves, the limit doesn't exist.