SOLUTIONS TO EVEN PROBLEMS

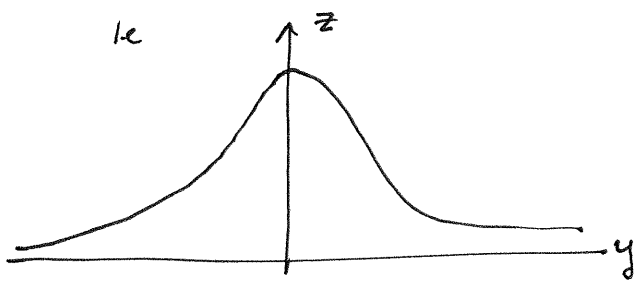
14.1 (SOLUTIONS to odd problems are in the Appendix).

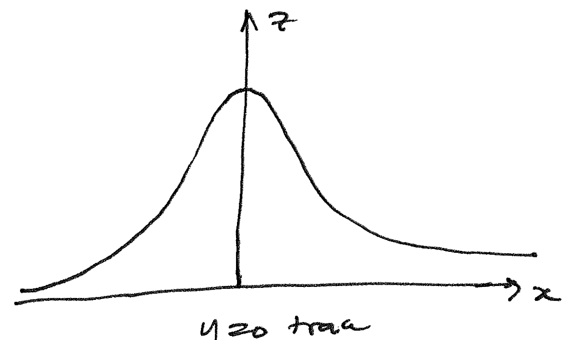
32 (a) $f(x,y) = \dfrac{1}{1+x^2+y^2}$

Notice that the trace along $x=0$ is $z = \dfrac{1}{1+y^2}$ and along $y=0$

$z = \dfrac{1}{1+x^2}$.

ie





the only graph that fits this pattern is III

You can also note that the level curves $\dfrac{1}{1+x^2+y^2} = k$

$\Leftrightarrow \quad x^2+y^2 = \dfrac{1}{k} - 1$ are a family of circles for $k<1$.

(b) $f(x,y) = \dfrac{1}{1+x^2y^2}$. The trace in $x=0$ is the line $z=1$ and $y=0$ is also $z=1$.

Graphs I & II are possible candidates but in this case $z>0$ so it has to be I

(c) $f(x,y) = \ln(x^2+y^2)$.

trace in $x=0$ is $z = \ln y^2$, in $y=0$ $z=\ln x^2$ so $z \to \infty$ as x and $y \to \infty$

the level curves of f are $\ln(x^2+y^2) = k \Leftrightarrow x^2+y^2 = e^k$ is a family of circles and f becomes large and negative when $(x,y) \to 0$ so IV

(d) $f(x,y) = \cos\left(\sqrt{x^2+y^2}\right)$

the level curves at $k=0$ $\cos\sqrt{x^2+y^2} = 0 \iff x^2+y^2 = \left(\frac{\pi}{2} + n\pi\right)^2$

is a family of circles so V

(e) $f(x,y) = |xy|$, trace in $x=0$ is $z=0$ so it must be $\overline{VI}$

trace in $y=0$ is $z=0$

(f) $f(x,y) = \cos(xy)$

trace in $x=0$ $z = \cos(0) = 1$

" " $y=0$ $z = \cos(0) = 1$

z can be negative so II.