

Section D02

NAME _____

Harry Potter

ver.A

Please print

(30 points total)

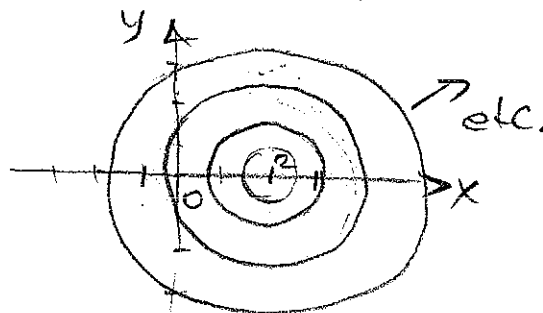
1. (12.2, #6) (5 pts) State the largest possible domain of definition of the function $f(x, y) = \sqrt{2x} + \sqrt[3]{3y}$

$\sqrt{2x}$ is real if $x \geq 0$; $\sqrt[3]{3y}$ is real for any $y \Rightarrow$

\Rightarrow domain of $f(x, y)$: all pts (x, y) for which $x \geq 0$

2. (12.2, #37) (5 pts) Sketch a few typical level curves of the function $f(x, y) = x^2 + y^2 - 4x$

Circles centered @ $(2, 0)$:



3. (12.3, #14) (5 pts) Use the consequences of continuity to evaluate the limit $\lim_{(x,y,z) \rightarrow (2,-1,3)} \frac{x+y+z}{x^2+y^2+z^2}$

$f(x, y, z) = \frac{x+y+z}{x^2+y^2+z^2}$ is continuous wherever $x^2+y^2+z^2 \neq 0$, i.e. except $(0, 0, 0)$

$$\lim_{(x,y,z) \rightarrow (2,-1,3)} f(x, y, z) = f(2, -1, 3) = \frac{2-1+3}{2^2+1^2+3^2} = \frac{4}{14} = \frac{2}{7}$$

4. Compute the partial derivatives of the functions:

(12.4, #4) (7 pts) $f(x, y) = x^2 e^{xy}$

$$f_x = 2x e^{xy} + x^2 y e^{xy} = x e^{xy} (xy + 2)$$

$$f_y = x^2 e^{xy}$$

(12.4, #16) (8 pts) $f(u, v) = (2u^2 + 3v^2) \exp(-u^2 - v^2)$

$$\begin{aligned} f_u &= 4u \exp(-u^2 - v^2) - (2u^2 + 3v^2) 2u \exp(-u^2 - v^2) = \\ &= 2u (2 - 2u^2 - 3v^2) \exp(-u^2 - v^2) \end{aligned}$$

$$\begin{aligned} f_v &= 6v \exp(-u^2 - v^2) - (2u^2 + 3v^2) 2v \exp(-u^2 - v^2) = \\ &= 2v (3 - 2u^2 + 3v^2) \exp(-u^2 - v^2) \end{aligned}$$