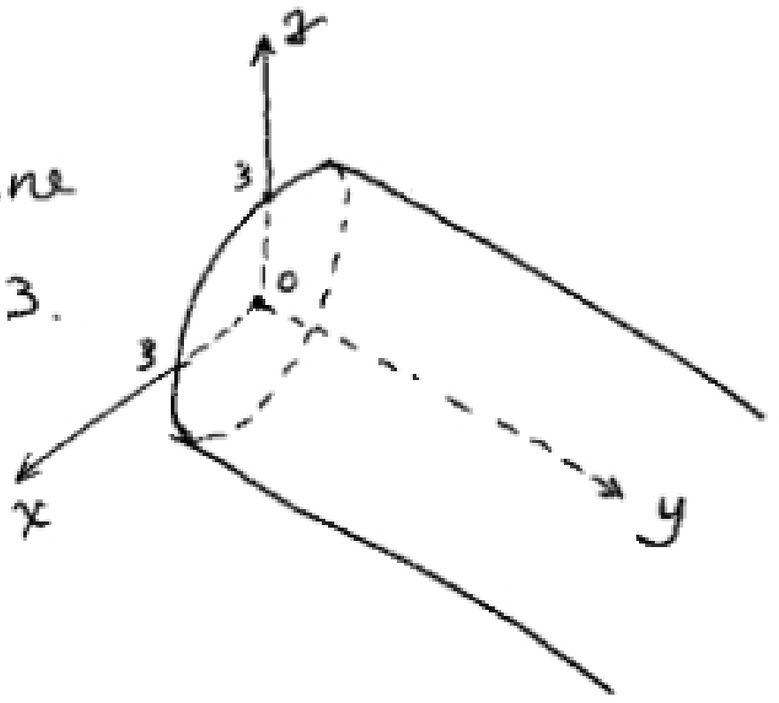
MATH 2339, Fall 2013

HW02: Solution

§10.1

(2) 29/ $x^2 + z^2 \le 9$

[Soln.] $x^2 + z^2 = 9$ on the xz-plane is a circle with radius r=3.



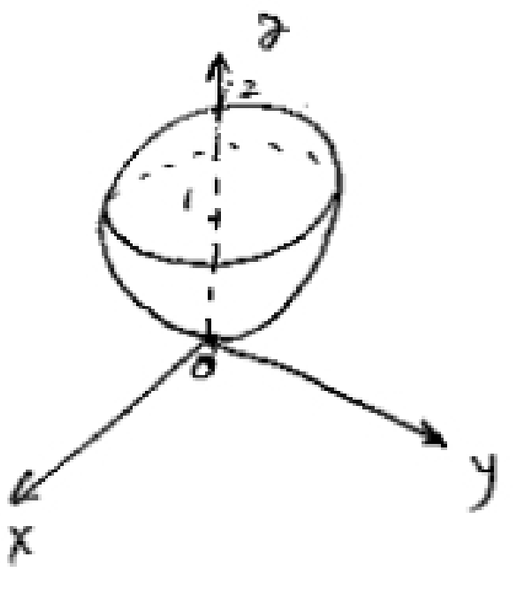

in $\mathbb{R}^3$: $x^2 + z^2 \le 9$ represents the region on and inside the cylinder generated by translating the circle $x^2 + z^2 = 9$ along the y-axis.

(3) 30/ $x^2 + y^2 + z^2 > 2z$

$\Leftrightarrow x^2 + y^2 + z^2 - 2z > 0$

$\Leftrightarrow x^2 + y^2 + [(z^2 - 2z + 1) - 1] > 0$

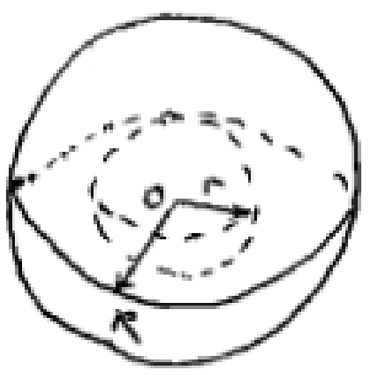
(2) $\Leftrightarrow x^2 + y^2 + (z-1)^2 > 1$




① So: The inequality represents the region outside a sphere with center (0, 0, 1) and radius 1.

(2) 33/ The region consisting all points between (but not on) the spheres of radius r and R centered at the origin, where $r < R$.

$$r^2 < x^2 + y^2 + z^2 < R^2$$



④ 35/ Let $P(x, y, z)$ be a point in the set. Then:

$$|PA| = |PB|$$

$$\Leftrightarrow \sqrt{[x-(-1)]^2 + (y-5)^2 + (z-3)^2}$$

$$= \sqrt{(x-6)^2 + (y-2)^2 + [z-(-2)]^2}$$

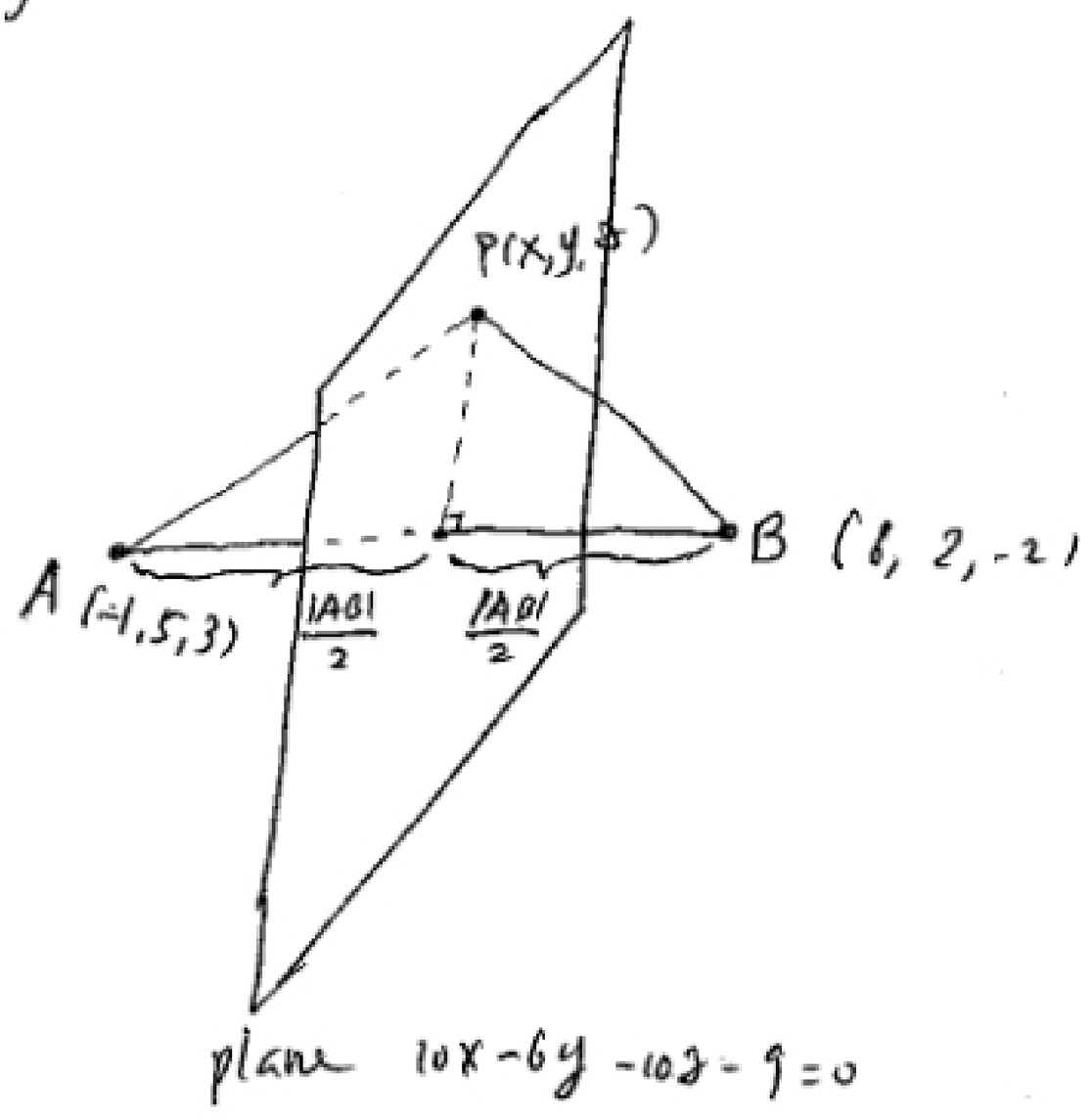
$$\Leftrightarrow (x+1)^2 + (y-5)^2 + (z-3)^2 = (x-6)^2 + (y-2)^2 + (z+2)^2$$

$$\Leftrightarrow (x^2+2x+1) + (y^2-10y+25) + (z^2-6z+9)$$

$$= (x^2-12x+36) + (y^2-4y+4) + (z^2+4z+4)$$

$$② \Rightarrow 10x - 6y - 10z - 9 = 0$$

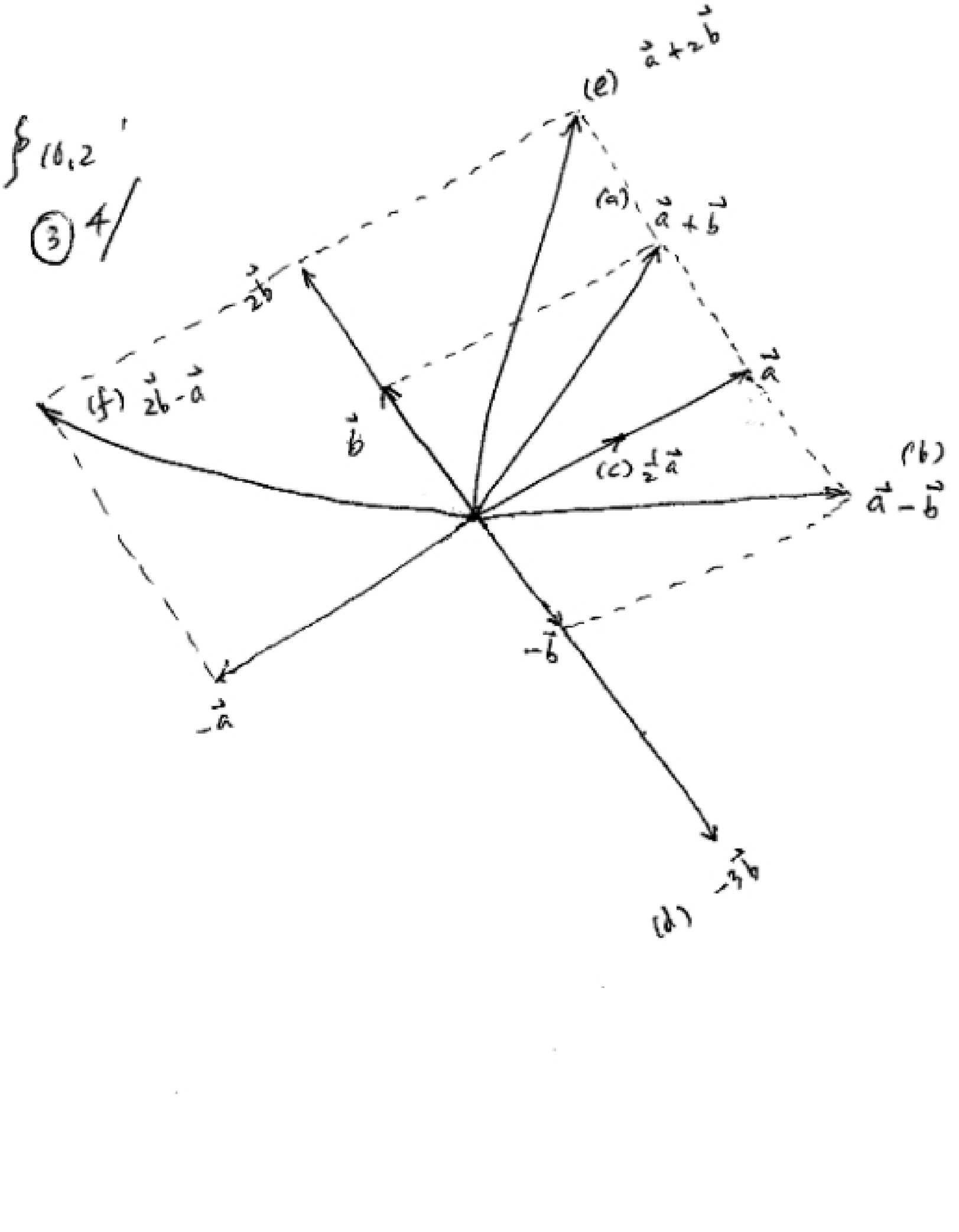
② These points fall on a plane perpendicular to AB and in the middle of AB, as shown in the following figure.




(2

$\oint_{(0,2)}$

(3) 4/


(e) $\vec{a}+2\vec{b}$
(a) $\vec{a}+\vec{b}$
$2\vec{b}$
(f) $2\vec{b}-\vec{a}$
$\vec{b}$
$\vec{a}$
(c) $\frac{1}{2}\vec{a}$
(b) $\vec{a}-\vec{b}$
$-\vec{a}$
$-\vec{b}$
$-3\vec{b}$
(d)