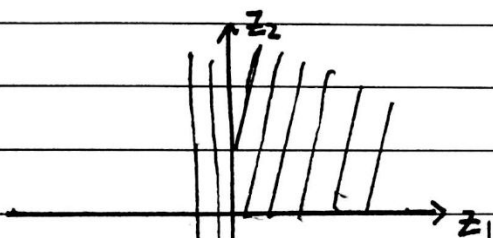1 (a)

$\min\ 3z_1 + 2z_2$

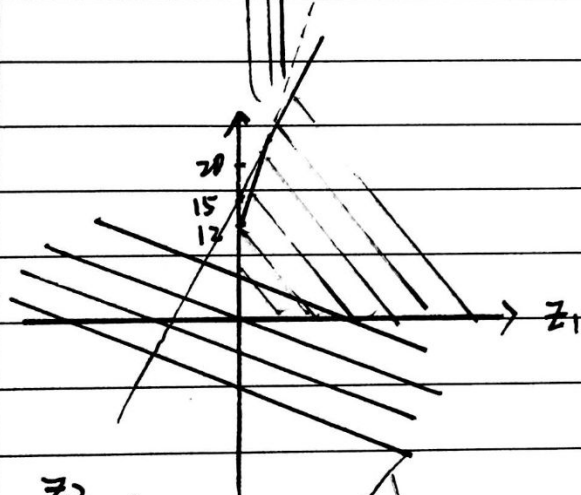z_1, z_2 s.t $z_1 \geq 0$

$z_2 \geq 0$.

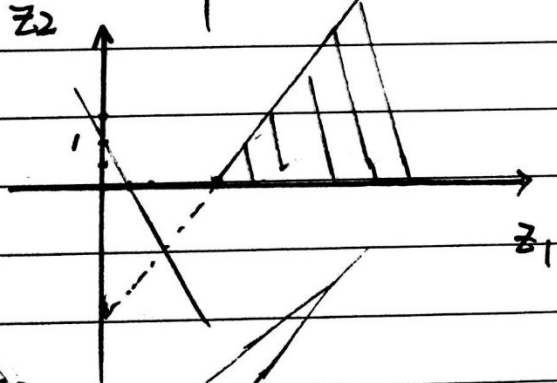traits: feasible. bounded, unique optimum [a]

(b)

traits: feasible, bounded, multiple optimum
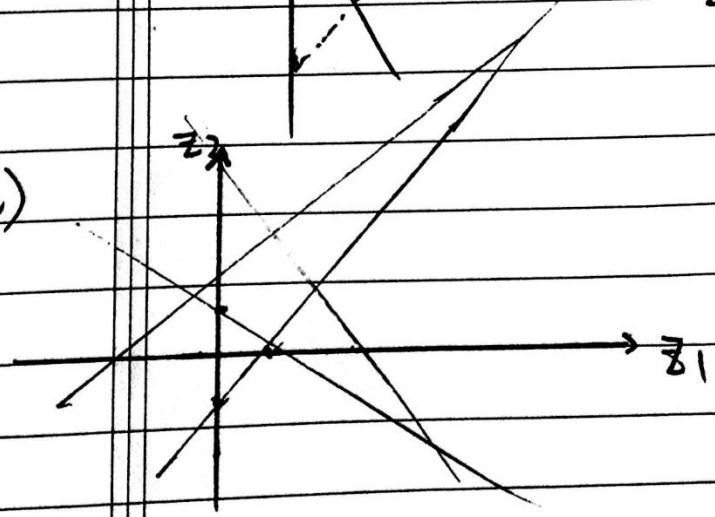
(c)

20
15
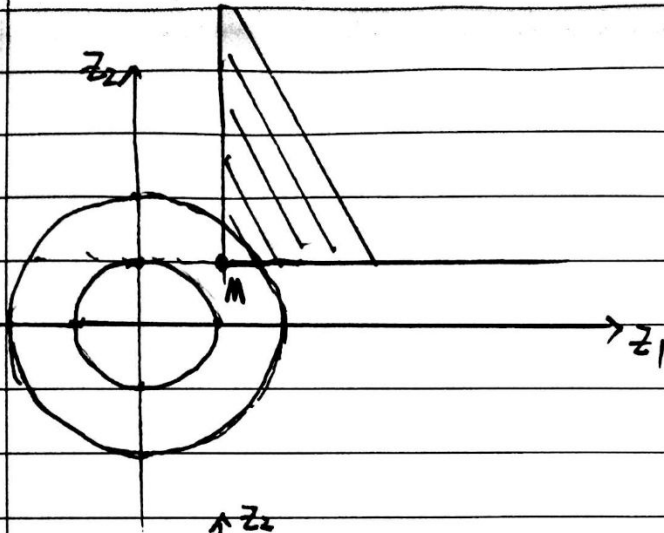12

feasible.
unbounded.

(d)

feasible, bounded.
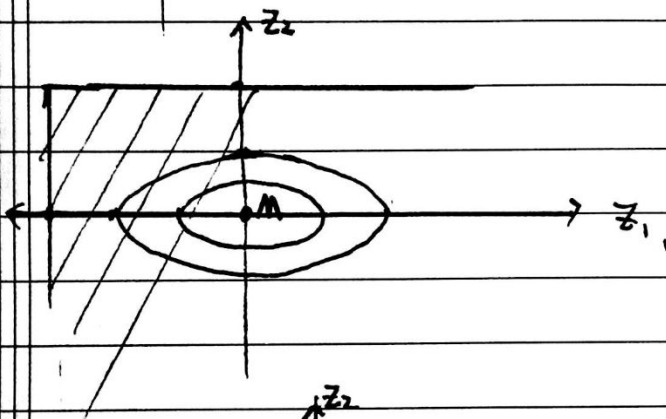multiple optimum.

(e)

infeasible.

2(a).

or active, where $z_1 \geq 1$
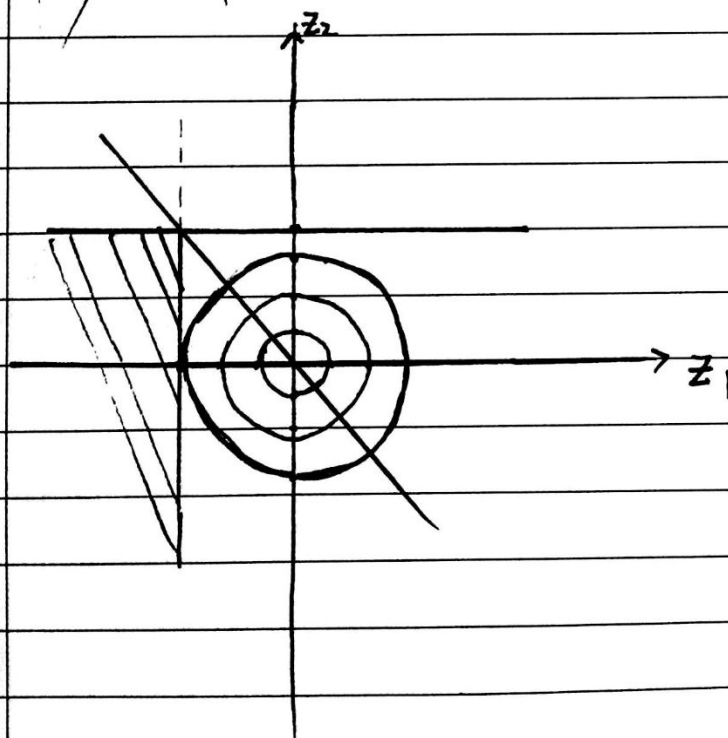
an active, where $z_2 \geq 1$

(b)

active, where $z_1 \geq -3$

active, where $z_2 \leq 2$

(c)

active $\leftarrow z_1 \leq -3$

inactive $\leftarrow z_2 \leq 4$

redundant $\leftarrow 4z_1 + 3z_2 \leq 0$

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3(a).

cost of z^*

$$= \frac{1}{2}(z_1^{*2} + z_2^{*2} + 2|z_3^{*2}|) + 0.55 z_3^*$$

$$= \frac{1}{2}(0.5^2 + 0.5^2 + 0) + 0$$

$$= 0.25$$

Point 1 $(0.45, 0.5, 0.05)$

cost of point1 $= \frac{1}{2}(0.45^2 + 0.5^2 + {}^{0.1}0.3 + 0.8 \overset{0.55}{=} \cancel{0.22175} \; 0.253875$

Point 2 $(0.5, 0.4, 0.1)$

cost of point2 $= \frac{1}{2}(0.5^2 + 0.4^2 + {}^{0.1}0.3 + \cancel{} + 0.55 \cdot 0.1 = 0.2605$

Point 3 $(0.45, 0.4, 0.15)$

cost of point3 $= \frac{1}{2}(0.45^2 + 0.4^2 + 0.1 \cdot 0.15) + 0.55 \cdot 0.15 = 0.264875$

z^* may be a local minimum

3(b). z^* is not a global minimum

$\because$ cost of point $(0,0,0) = 0 <$ cost of $z^* = 0.25$