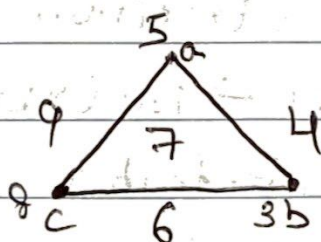T. Daneeth Reddy
UAlbany ID: 001491692.

1) considering the simplex

Let $\alpha = \{b\}$, $\beta = \{c, b\}$

$f(\alpha) = 3$, $f(\beta) = 6$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

But when $\alpha = \{c\}$, $\beta = \{c, b\}$

$f(\alpha) = 8$, $f(\beta) = 6$

$f(\beta) < f(\alpha) \rightarrow$ Exception

& $f(\{a, b, c\}) > f(\beta) \rightarrow$ No Exception

∴ f is Morse near β

Let $\alpha = \{c\}$ $\beta = \{a, c\}$

$f(\alpha) = 8$, $f(\beta) = 9$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

Similarly when $\alpha = \{a\}$ & $\beta = \{a, c\}$

$f(\alpha) = 5$, $f(\beta) = 9$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

But $f(\beta) = 9 > f(\{a, b, c\}) = 7 \rightarrow$ Exception

There is only one Exception.

∴ f is Morse near β.

Let $\alpha = \{a\}$, $\beta = \{a, b\}$

$f(\alpha) = 5$, $f(\beta) = 4$

$f(\alpha) > f(\beta) \rightarrow$ Exception

But $f(\beta) < f(a, b, c) \rightarrow$ NO Exception
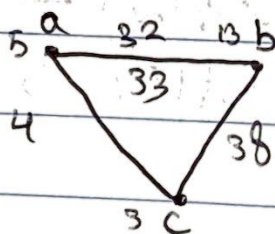
when $\alpha = \{b\}$, $\beta = \{a, b\}$

$f(\alpha) = 3$, $f(\beta) = 4$

$f(\beta) > f(\alpha) \rightarrow$ NO Exception

$\therefore$ f is Morse near β.

Hence the whole simplex gives the Morse func

Considering the Simplex

Let $\alpha = \{c\}$, $\beta \{c, b\}$

$f(\alpha) = 3$, $f(\beta) = 38$

$f(\beta) > f(\alpha) \rightarrow$ NO Exception

Similarly when $\alpha = \{b\}$, $\beta = \{c, b\}$

$f(\alpha) = 13$, $f(\beta) = 38$

$f(\beta) > f(\alpha) \rightarrow$ NO Exception

But $f(\beta) > f(\{a, b, c\}) = 33 \rightarrow$ Exception

$\therefore$ f is Morse near β.

Let α{b}, β={a,b}

$f(α) = 13$, $f(β) = 32$

$f(β) > f(α) \rightarrow$ NO Exception

Similarly, when α = {a}, β{a,b}

$f(α) = 5$, $f(β) = 32$

$f(β) > f(α) \rightarrow$ NO Exception

& also $f(\{a,b,c\}) > f(β) \rightarrow$ NO Exception

∴ f is Morse near β

Let α = {a}, β = {a,c}

$f(α) = 5$, $f(β) = 4$

$f(β) \not< f(α) \Longrightarrow$ Exception

Similarly, when α = {c}, β = {a,b}

$f(α) = 3$, $f(β) = 4$

$f(β) > f(α) \rightarrow$ NO Exception

& also f(β) $f(β) < f(\{a,b,c\}) \rightarrow$ NO Exception

∴ f is Morse Near β.

Hence the whole simplex gives the Morse function.

consider the simplex

Let $\alpha = \{c\}$ $\beta = \{a, c\}$

$f(\alpha) = 1$, $f(\beta) = 39$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

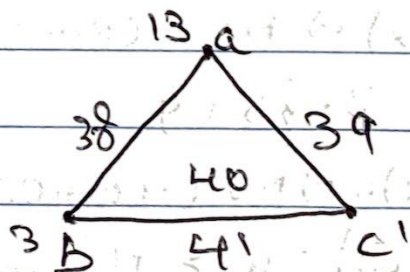when $\alpha = \{a\}$ & $\beta = \{a, c\}$

$f(\alpha) = 13$, $f(\beta) = 39$

$f(\beta) > f(\alpha) \rightarrow$ NO Exception

& also $f(\beta) < f(\{a, b, c\}) \rightarrow$ No Exception

∴ f is morse Near β.

Let $\alpha = \{a\}$, $\beta = \{a, b\}$

$f(\alpha) = 13$, $f(\beta) = 38$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

when $\alpha = \{b\}$, $\beta = \{a, b\}$

$f(\alpha) = 3$, $f(\beta) = 38$

$f(\beta) > f(\alpha) \rightarrow$ NO Exceptions

& $f(\beta) > f(\{a, b, c\}) \rightarrow$ NO Exception

∴ f is morse near β.

Let $\alpha = \{b\}$, $\beta = \{b, c\}$

$f(\alpha) = 3$, $f(\beta) = 41$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

when $\alpha = \{c\}$, $\beta = \{b, c\}$
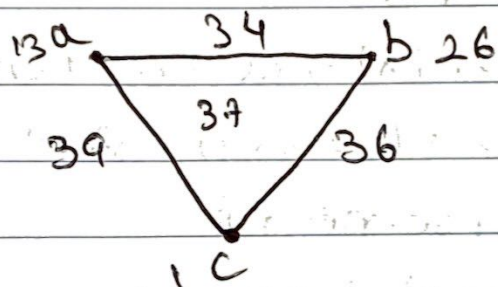
$f(\beta) > f(\alpha) \rightarrow$ NO Exception

BUt $f(\beta) = f(\{b, c\}) = 41 > f(\{a, b, c\}) = 40 \rightarrow$ Exception

There is only one Exception.

∴ f is morse on β.

Hence the whole simplex gives the morse function.

considering the simplex

Let $\alpha = \{c\}$, $\beta = \{b, c\}$

$f(\alpha) = 1$, $f(\beta) = 36$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

when, $\alpha = \{b\} \Rightarrow f(\alpha) = 26$

$f(\beta) > f(\alpha) \Rightarrow$ No Exception

& also $f(\beta) < f(\{a, b, c\}) = 37 \rightarrow$ No Exception

∴ f is morse near β.

Let $\alpha = \{b\}$, $\beta = \{a, b\}$

$f(\alpha) = 26$, $f(\beta) = 34$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

when $\alpha = \{a\} \Rightarrow f(\alpha) = 13$

$f(\beta) > f(\alpha) \rightarrow$ No Exception

& also $f(\beta) < f(\{a,b,c\}) \to$ NO Exception

∴ f is morse near β.

Let $\alpha = \{a\}$, $\beta = \{a,c\}$

$f(\alpha) = 13$, $f(\beta) = 39$

$f(\beta) > f(\alpha) \to$ No Exception.

when $\alpha = \{c\} \Rightarrow f(\alpha) = 1$

$f(\beta) > f(\alpha) \to$ NO Exception

But $f(\beta) = 39 > f(\{a,b,c\}) = 37 \to$ Exception

∴ f is morse near β.

Hence the whole simplex gives the morse function.

considering the simplex

let $\alpha = \{b\}$, $\beta = \{b,c\}$

$f(\alpha) = 1$, $f(\beta) = 2$

$f(\beta) > f(\alpha) \to$ NO Exception

when $\alpha = \{c\} \Rightarrow f(\alpha) = 14$

Then $f(\beta) < f(\alpha) \to$ Exception

But $f(\beta) < f(\{a,b,c\}) = 35 \rightarrow$ NO EXCEPTION

$\therefore$ f is morse near β.

Let $\alpha = \{c\}$, $\beta = \{a,c\}$

$f(\alpha) = 14$, $f(\beta) = 29$

$f(\beta) > f(\alpha) \rightarrow$ NO EXCEPTION
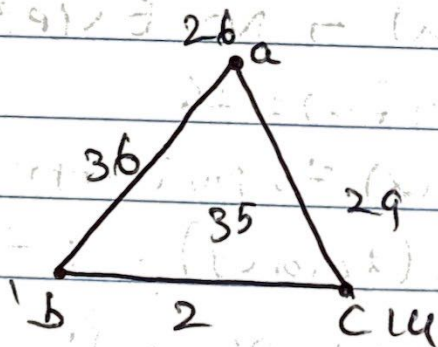
when $\alpha = \{a\} \Rightarrow f(\alpha) = 26$

$f(\beta) > f(\alpha) \rightarrow$ NO EXCEPTION

& also $f(\beta) < f(\{a,b,c\}) \rightarrow$ NO EXCEPTION

$\therefore$ f is morse near β.

Let $\alpha = \{a\}$, $\beta = \{a,b\}$

$f(\alpha) = 26$, $f(\beta) = 36$

$f(\beta) > f(\alpha) \rightarrow$ NO EXCEPTION

when $\alpha = \{b\} \Rightarrow f(\alpha) = 1$

$f(\beta) > f(\alpha) \rightarrow$ NO EXCEPTION
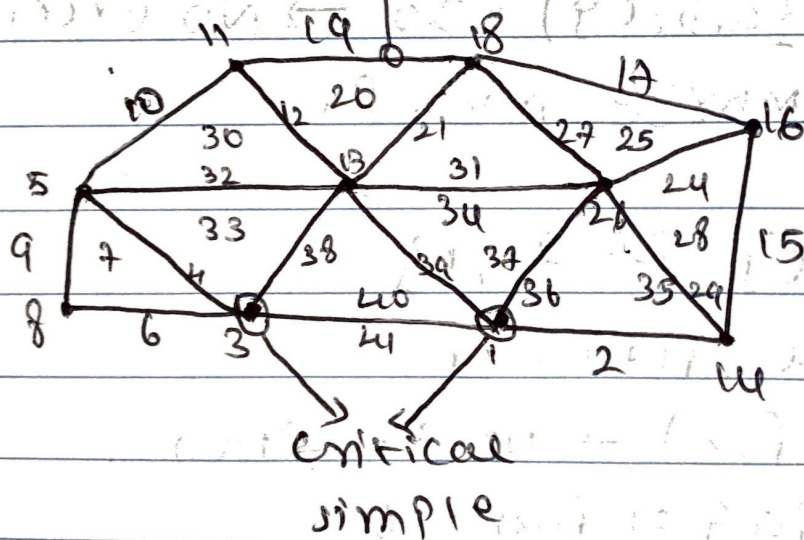
$\therefore$ f is morse near β.

But $f(\beta) > f(\{a,b,c\}) = 36 \rightarrow$ EXCEPTION

$\therefore$ f is morse near β

Hence the whole simplex gives the morse function.

b

critical simplex

11 19 18 17 16

10 20 12 30 32 13 21 31 27 25 24 28

5 33 9 7 38 34 37 26 35 29 15

8 6 3 40 36 2

4 1 4

critical
simple

considering the whole fig, obtained are the critical simplices.

2)

e 10   11   d   5   g 4   b 15

61 59   50   55   45   36   35   24   18

72   68   23

7 f   94   a   25 56   40   c   46   1   e   d

  26   69   11   1

16   70   98   84   94   45   35   10

65   90   91   37

d   g   4   b   62   c 7

1   5   4   15

13   60   16

d 1