1 Q1

Coincidental correctness occurs when no failure is detected even though a fault has been executed. For example, if we wanted to implement $cos(yx)$ and we wanted to test $y = 2$ and $x = 0$, we would expect the program to calculate the answer through something like $cos((2)(0)) = cos(0) = 1$. Had our implementation been incorrect and be something like $cos(\frac{1}{2}yx)$, then the output would still be 0. So although in this case, it returned the correct answer, the implementation is incorrect. This is just a coincidence that the answer is right for this scenario.

2 Q2

1. Maximal number of rules = 12. This is calculated using: Gender(2 options) * City dwelling(2 options) * Age groups(3 options) = 2*2*3 = 12

Rule #	1	2	3	4	5	6	7	8	9	10	11	12
Gender	M	F	M	F	M	F	M	F	M	F	M	F
City	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No
Age Group	<25	<25	<25	<25	<65 & >= 25	<65 & >=25	<65 & >=25	<65 & >=25	>65	>65	>65	>65
A	X				X				X			
B	X		X									
C								X				
D	X	X	X	X	X	X	X	X		X		X

2. Simplified table

Rule #	1	2	3	4	5	6	7	8	9	10
Gender	M	F	M	F	M	M	F	M	F	M
City	Y	Y	N	N	Y	N	N	Y	Y	N
Age Group	<25	-	<25	<25	<65 & >25	<65 & >25	<65 & >25	>65	>65	>65
A	X				X			X		
B	X		X							
C							X			
D	X	X	X	X	X	X	X		X	

3 Q3

The subdomain is bounded by the linear functions

$$y \geq -x$$

$$y < 6$$
$$x - 2 \le y$$
$$x > 1$$
$$z > 0$$
$$z < 6$$

EPC Strategy

The EPC strategy places the test points at the corners of the shape. The min for x is 1 and the max for x is 8. The min for y is -1 and the max for y is 6. The min for z is 0 and the max is 6. We are expecting $4^3 + 1 = 65$ test cases. The extreme points chosen are (8, 8.1, 1, 0.9) for x, (6, 6.1, -1, -1.1) for y, and (6, 6.1, 0, -0.1)

Test	x	y	z	Pass?	Test	x	y	z	Pass?	Test	x	y	z	Pass?
1	8	6	6	No	23	8.1	6.1	-1	No	45	1	-1.1	6	No
2	8	6	6.1	No	24	8.1	6.1	-1.1	No	46	1	-1.1	6.1	No
3	8	6	-1	No	25	8.1	-1	6	No	47	1	-1.1	-1	No
4	8	6	-1.1	No	26	8.1	-1	6.1	No	48	1	-1.1	-1.1	No
5	8	6.1	6	No	27	8.1	-1	-1	No	49	0.9	6	6	No
6	8	6.1	6.1	No	28	8.1	-1	-1.1	No	50	0.9	6	6.1	No
7	8	6.1	-1	No	29	8.1	-1.1	6	No	51	0.9	6	-1	No
8	8	6.1	-1.1	No	30	8.1	-1.1	6.1	No	52	0.9	6	-1.1	No
9	8	-1	6	No	31	8.1	-1.1	-1	No	53	0.9	6.1	6	No
10	8	-1	6.1	No	32	8.1	-1.1	-1.1	No	54	0.9	6.1	6.1	No
11	8	-1	-1	No	33	1	6	6	No	55	0.9	6.1	-1	No
12	8	-1	-1.1	No	34	1	6	6.1	No	56	0.9	6.1	-1.1	No
13	8	-1.1	6	No	35	1	6	-1	No	57	0.9	-1	6	No
14	8	-1.1	6.1	No	36	1	6	-1.1	No	58	0.9	-1	6.1	No
15	8	-1.1	-1	No	37	1	6.1	6	No	59	0.9	-1	-1	No
16	8	-1.1	-1.1	No	38	1	6.1	6.1	No	60	0.9	-1	-1.1	No
17	8.1	6	6	No	39	1	6.1	-1	No	61	0.9	-1.1	6	No
18	8.1	6	6.1	No	40	1	6.1	-1.1	No	62	0.9	-1.1	6.1	No
19	8.1	6	-1	No	41	1	-1	6	No	63	0.9	-1.1	-1	No
20	8.1	6	-1.1	No	42	1	-1	6.1	No	64	0.9	-1.1	-1.1	No
21	8.1	6.1	6	No	43	1	-1	-1	No	65	1	1	1	No
22	8.1	6.1	6.1	No	44	1	-1	-1.1	No					

Weak Nx1 Strategy

For the weak nx1 strategy

Test Number	x	y	z	Passed?
1	1	0	1	No
2	6	3	4	No
3	6	5	3	Yes
4	6	6	2	No
5	2	6	5	No
6	7	5	0	No
7	2	3	3	Yes
8	7	5	6	No
9	3	2	5	Yes
10	1	4	4	No
11	4	4	0	No
12	4	6	4	No
13	1	6	5	No
14	4	4	6	No
15	3	2	1	Yes
16	3	1	6	No
17	3	1	2	Yes
18	3	1	0	No
19	5	3	3	Yes
20	1	-1	1	Yes
21	2	3	0	No
22	7	5	5	Yes
23	3	2	3	Yes
24	2	3	6	No
25	8	6	1	No
26	1	2	2	No

For the next subdomain, there are 4 dimensions (x, y, z, w) making us require a total of $4^4 + 1 = 257$ tests

4 Q4

In a quadratic equation, there are always two roots. In general, to solve for these roots, you can use the quadratic equation where the roots will always be one of the three: real and distinct, real and equal, or complex. The discriminant is the expression $b^2 - 4ac$ for any quadratic equation $ax^2 + bx + c = 0$. Based on the sign of this expression, you can determine how many real number solutions the quadratic equation has. This expression is not a linear boundary and is not ideal when weak nx1 testing. To use weak nx1 testing in this case, we would need to have many subdivisions. Further, EPC testing is also not ideal since the domain for a quadratic function is always $(-\infty, \infty)$. This makes it impossible to choose a min and max value. If we bound the inputs, then EPC testing would be possible.

5 Q5

$$\begin{aligned}P(f_1) &= (0.5)(0.3)(0.0) + (0.5)(0.7)(0.1) + (0.1)(0.6)(0.5) + (0.1)(0.4)(0.1) \\ &+ (0.4)(0.7)(0.1) + (0.4)(0.3)(0.0) \\ &= 0 + 0.035 + 0.03 + 0.004 + 0.028 + 0 \\ &= 0.097\end{aligned}$$

$$\begin{aligned}P(f_2) &= (0.5)(0.3)(0.3) + (0.5)(0.7)(0.1) + (0.1)(0.6)(0.1) + (0.1)(0.4)(0.9) \\ &+ (0.4)(0.7)(0.3) + (0.4)(0.3)(0.8) \\ &= 0.045 + 0.035 + 0.006 + 0.036 + 0.084 + 0.096 \\ &= 0.302\end{aligned}$$

$$\begin{aligned}P(f_3) &= (0.5)(0.3)(0.5) + (0.5)(0.7)(0.3) + (0.1)(0.6)(0.0) + (0.1)(0.4)(0.0) \\ &+ (0.4)(0.7)(0.2) + (0.4)(0.3)(0.0) \\ &= 0.075 + 0.105 + 0 + 0 + 0.056 + 0 \\ &= 0.236\end{aligned}$$

$$\begin{aligned}P(f_4) &= (0.5)(0.3)(0.2) + (0.5)(0.7)(0.5) + (0.1)(0.6)(0.4) + (0.1)(0.4)(0.0) \\ &+ (0.4)(0.7)(0.4) + (0.4)(0.3)(0.2) \\ &= 0.03 + 0.175 + 0.024 + 0 + 0.112 + 0.024 \\ &= 0.365\end{aligned}$$

Therefore $f_4 > f_2 > f_3 > f_1$