Question 1
i) $E(x) \wedge T(x)$
ii) You only eat food that tastes good and is not healthy.

Question 2
$P(x) \to Q(x)$ where $P(x)$ is the statement that the three integers are consecutive and $Q(x)$ is they are
divisible by three.
Assume three consecutive integers $x, x+1, x+2$ then the sum of these integers is $3x + 3$ which is always
divisible by three:

$$\frac{3x+3}{3} = x+1$$

This completes the proof.

Question 3
$((p \vee q) \wedge (\neg q \vee r)) \to (q \vee r)$

p	q	r	$\neg q$	$(p \vee q)$ (1)	$(\neg q \vee r)$ (2)	$1 \wedge 2$ (3)	$(q \vee r)$ (4)	$3 \to 4$
1	1	1	0	1	1	1	1	1
1	1	0	0	1	0	0	1	1
1	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	0	0
0	1	1	0	1	1	1	1	1
0	1	0	0	1	0	0	1	1
0	0	1	1	0	1	0	1	1
0	0	0	1	0	1	0	0	1

Not a tautology

Question 4
They are associative

Question 5
Basis step: n = 0
$1 + 3(0) \leq 4^0$
$1 \leq 1$ so the basis step checks out.
Inductive step:
$1 + 3(k) + (k+1) \leq 4^{(k+1)} + (k+1)$
Since we are adding $k+1$ to each side we only need to show that:
$1 + 3(k) \leq 4^{(k+1)}$
Which is obvious since the left hand side will be negative for all n ≤ 0.

Question 6

Proof by induction:
A single break for a bar of size mn will produce two squares with size m_1n_1 and m_2n_2. The sum of
these squares equals the total size of the bar $mn = m_1n_1 + m_2n_2$ so each break produces $mn + 1$ bars
and proves that for mn breaks we only need $mn - 1$ breaks in the bar.

Question 7
I have no idea I can't see any of the summations on blackboard!