**Answers Intermediate test Calculus, 2WBB3, Monday 3 October 2016, version 2**

1. In view of the domain of $\sqrt{\cdot}$, we should have $x \geq 3$. Squaring $\sqrt{x-3} = x - 5$ gives $x - 3 = x^2 - 10x + 25$, so $x^2 - 11x + 28 = (x-4)(x-7) = 0$, so $x = 4$ or $x = 7$. Checking of these values shows that only $x = 7$ is a solution. Checking some values for $x$, such as $x = 4$ and $x = 8$ gives the answer $x \in [3, 7)$.

2. Completing the square: $x^2-6x+9-9+y^2+8y+16-16 \geq 0$ so $(x-3)^2+(y+4)^2 \geq 25$. This is everything outside (and including the border of) the circle with center $(3, -4)$ and radius 5, which passes through the origin $(0, 0)$.

3. Since this is a limit of the type $\infty/\infty$, we divide by the largest quantity of the denominator:

$$\lim_{x\to\infty} \frac{\frac{7}{x} - 7 + \frac{\cos(7x)}{x}}{7 - \frac{\sin(7x)}{x}} = \frac{0 - 7 + 0}{7 - 0} = -1.$$

   Hereby we have used the following: since $-\frac{1}{x} \leq \frac{\sin(7x)}{x} \leq \frac{1}{x}$, we have by the squeeze theorem $\lim\limits_{x\to\infty} \frac{\sin(7x)}{x} = 0$, and the same for $\lim\limits_{x\to\infty} \frac{\cos(7x)}{x} = 0$.

4. The normal to the plane has the direction $(1, 2, -2)$. The line through $(1, -1, 1)$ in this direction has parametrization $(x, y, z) = (1 + t, -1 + 2t, 1 - 2t)$. Substitution in the plane gives $1 + t + 2(-1 + 2t) - 2(1 - 2t) = 6$, so $t = 1$, with corresponding point $(2, 1, -1)$. The distance is the length of $(1, 2, -2)$, so 3.