AS Maths Key Skills Check 6 CM

Name: _____

1. (a) " $x^2+7x+9>0$ for all x". **Disprove** this statement using a suitable counter-example. (b) Find the values of k such that $x^2+7x+k>0$ for all x	(a) e.g. take $x = -2$, then $(-2)^2 + 7(-2) + 9 = -1 < 0$, which contradicts the statement (b) This requires the quadratic to have no real roots, so we want the discriminant to be negative, i.e. $7^2-4(1)(k)<0 \Rightarrow k>\frac{49}{4}$
2. The line l_1 passes through $(-3, 7)$ and $(5, 6)$. The line l_2 is $5x - 3y = 1$. The line l_3 is tangent to $y=x^2$ at $x=4$. Determine whether the lines (i) l_1 and l_2 (ii) l_1 and l_3 (iii) l_2 and l_3 are parallel, perpendicular or neither.	[Tip: you only need the gradients in this question, so don't waste time finding the equations…] The gradient of l_1 is $-\frac{1}{8}$. The gradient of l_2 is $\frac{5}{3}$. The gradient of l_3 is $2(4) = 8$. (i) Neither (ii) Neither (iii) Perpendicular
3. Find a unit vector in the direction of AB given that A and B have position vectors $5\mathbf{i} - 3\mathbf{j}$ and $9\mathbf{i}$ respectively.	$\overrightarrow{AB} = 4\mathbf{i} + 3\mathbf{j}$. So unit vector is $\frac{1}{5}(4\mathbf{i} + 3\mathbf{j})$
4. Solve the equation $5^{x+1} = 7$	$\ln(5^{x+1}) = \ln 7$ $\Rightarrow (x+1)\ln 5 = \ln 7$ $\Rightarrow x = 0.209...$