	# Worksheet 1
	## Problems using Vieta's formulas
1.	First, we rewrite $x_1^2+x_2^2$ in terms of elementary symmetric polynomials: $x_1^2+x_2^2 = x_1^2+2x_1x_2+x_2^2-2x_1x_2 = (x_1+x_2)^2-2x_1x_2$. By Vieta's formulas we have $x_1+x_2=-5$ and $x_1x_2=-3$. We substitute in the expression in order to get $x_1^2+x_2^2=(-5)^2-2.(-3)=25+6=31$.
2.	First, we rewrite $x_1^2+x_2^2$ in terms of elementary symmetric polynomials: $x_1^2+x_2^2 = x_1^2+2x_1x_2+x_2^2-2x_1x_2 = (x_1+x_2)^2-2x_1x_2$. By Vieta's formulas we have $x_1+x_2=-11$ and $x_1x_2=12$. We substitute in the expression in order to get $x_1^2+x_2^2=(-11)^2-2.12=121-24=97$.
3.	$\frac{1}{x_1}+\frac{1}{x_2}=\frac{x_2}{x_1x_2}+\frac{x_1}{x_1x_2}=\frac{x_1+x_2}{x_1x_2}$. From Vieta's formulas, we have $x_1+x_2=-9$, $x_1x_2=33$. We substitute and get: $\frac{x_1+x_2}{x_1x_2}=\frac{-9}{33}=-\frac{3}{11}$
4.	We first rewrite the desired expression in terms of the elementary symmetric polynomials. $(x_1^3+x_2^3)+(x_1^2+x_2^2)+(x_1+x_2)=(x_1+x_2)(x_1^2+x_2^2-x_1x_2)+(x_1^2+2x_1x_2+x_2^2-2x_1x_2)+(x_1+x_2)=(x_1+$ $=(x_1+x_2)((x_1+x_2)^2-3x_1x_2)+(x_1+x_2)^2+(x_1+x_2)-2x_1x_2$ From Vieta's formulas, we know that $x_1+x_2=8$ and $x_2x_2=11$. We substitute: $8(8^2-3.11)+8^2+8-2.11=8(64-33)+64+8-22=8.31+50=8.31+8.6+2=8.37+2=298$
5.	First, we will use the following identity: $\lvert a\rvert=\sqrt{a^2}$. This leads us to $\lvert x_1-x_2\rvert=\sqrt{(x_1-x_2)^2}=\sqrt{x_1^2-2x_1x_2+x_2^2}=\sqrt{x_1^2+2x_1x_2+x_2^2-4x_1x_2}=\sqrt{(x_1+x_2)^2-4x_1x_2}$. Then we use Vieta's formulas to get $x_1+x_2=15$, $x_1x_2=36$. The result is $\sqrt{15^2-4.36}=\sqrt{225-144}=\sqrt{81}=9$
6.	$x_1-x_1^2+x_2-x_2^2=x_1+x_2-(x_1^2+x_2^2)=x_1+x_2-(x_1^2+2x_1x_2+x_2^2-2x_1x_2)=x_1+x_2-((x_1+x_2)^2-2x_1x$ From Vieta's formulas we know that $x_1+x_2=12$ and $x_1x_2=19$. We substitute and get $12(1-12)+2.19=-12.$
7.	We remove the parentheses and express in terms of the elementary symmetric polynomials: $x_1^2-2x_1\frac{1}{x_1}+\frac{1}{x_1^2}+x_2^2-2x_2\frac{1}{x_2}+\frac{1}{x_2^2}=x_1^2+x_2^2+\frac{1}{x_1^2}+\frac{1}{x_2^2}-4=x_1^2+x_2^2+\frac{x_1^2+x_2^2}{(x_1x_2)^2}-4=(x_1^2+x_2^2)(1+\frac{1}{(x_1x_2)^2})-$ By Vieta's formulas we have $x_1+x_2=4$ and $x_1x_2=1$. We substitute and get: $(4^2-2)(1+1)-4=(16-2).2-4$ $=24$
8.	From Vieta's formulas we have $x_1x_2=a^2-2a+1=(a-1)^2$. Since it is a perfect square, $(a-1)^2\geq 0$, with equality for $a=1$. So the answer is $a=1$ and the minimal value is 0.