CCSS Advanced Algebra 4 AA6: Complex Numbers Assessment A

Name:_____

C Level Questions

1. Use the Quadratic Formula *if* $ax^2+bx+c=0$, $x=\frac{-b+\sqrt{b^2-4ac}}{2a}$ or $x=\frac{-b-\sqrt{b^2-4ac}}{2a}$, to find the solutions to each equation:

a. $x^2+3x-8=0$

$x=\frac{-3\pm\sqrt{3^2-4(1)(-8)}}{2(1)}$

$=\frac{-3\pm\sqrt{9+32}}{2}$

$=\frac{-3\pm\sqrt{41}}{2}$

$=\frac{-3\pm 6.4}{2}$ $\quad +\ \frac{3.4}{2}=1.7$ $\quad -\ \frac{-9.4}{2}=-4.7$

b. $5x^2=-6x-1$

$+6x+1 \quad +6x+1$

$5x^2+6x+1=0$

$x=\frac{-6\pm\sqrt{6^2-4(5)(1)}}{2(5)}$

$=\frac{-6\pm\sqrt{36-20}}{10}$

$=\frac{-6\pm\sqrt{16}}{10}$ $\quad +\ \frac{-2}{10}=-\frac{1}{5}$ $\quad -\ \frac{-10}{10}=-1$

2. Use the Quadratic Formula to find the complex roots of the function $g(x)=x^2+10x+26$.

$x=\frac{-10\pm\sqrt{10^2-4(1)(26)}}{2(1)}$

$=\frac{-10\pm\sqrt{100-104}}{2}$

$=\frac{-10\pm\sqrt{-4}}{2}$

$\frac{-10\pm 2i}{2}$ $\quad +\ \frac{-10+2i}{2}=-5+i$ $\quad -\ \frac{-10-2i}{2}=-5-i$

3. Simplify each rational expression fully.

a. $\frac{8x}{x-1}-\frac{8}{x-1}$

$\frac{8x-8}{x-1}=\frac{8(x-1)}{x-1}$

$=8$

b. $\frac{(x+1)(x^2-1)}{(x-1)^2(x^2-2x+1)}=\frac{(x+1)(x+1)(x-1)}{(x-1)^2(x-1)(x-1)}=\frac{(x+1)^2}{(x-1)^3}$

	$x+1$
x	x^2+x
-1	$x-1$

	$x-1$
x	x^2-x
-1	$-x+1$

4. Fully factor the polynomial and sketch a graph.

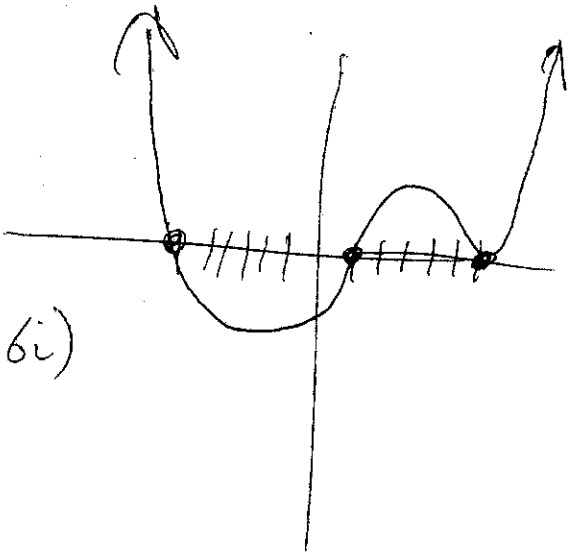
$f(x)=(x^2-36)(x^2+36)(x^2-7x+6)$

$(x+6)(x-6)(x+6i)(x-6i)(x-6)(x-1)$

$(x-6)^2(x+6)(x-1)(x+6i)(x-6i)$

Degree $=6$

LC $=1$



A/B Level Questions

5. The equation $x^2 + 3x + c = 0$ has complex roots $x = \frac{-3 \pm 2i}{2}$. What is the value of c? Show your work and/or explain your answer fully.

$\frac{-3 \pm \sqrt{3^2 - 4(1)(c)}}{2(1)}$

$\frac{-3 \pm \sqrt{9-4c}}{2} = \frac{-3 \pm 2i}{2}$

Thus

$\sqrt{9-4c} = 2i$,

So, $9-4c = (2i)^2$

$9-4c = 4i^2$

$9-4c = -4$

$-4c = -13$

$c = 13/4$

6. Given that $i = \sqrt{-1}$, show that $i^6 = -1$.

$i^6 = i \cdot i \cdot i \cdot i \cdot i \cdot i$

$\sqrt{-1}\sqrt{-1}, \sqrt{-1}\sqrt{-1}, \sqrt{-1}\sqrt{-1}$

$-1 \cdot -1 \cdot -1$

$1 \cdot -1 = -1$.

7. The polynomial $p(x) = x^4 - 16$ has 2 real roots ($x = 2$ *and* $x = -2$). Use polynomial division and the quadratic formula to find the 2 complex roots.

root $x = 2 \longrightarrow$ factor $(x-2)$. Divide by $(x-2)$

	x^3	$+2x^2$	$+4x$	$+8$
x	x^4	$2x^3$	$4x^2$	$8x$
-2	$-2x^3$	$-4x^2$	$-8x$	-16

$= (x-2)(x^3+2x^2+4x+8)$

root $x = -2 \longrightarrow$ factor $(x+2)$. Divide by $(x+2)$

	x^2	4
x	x^3	$4x$
$+2$	$2x^2$	8

$= (x+2)(x^2+4)$

QF, or set $=0$

$x^2 + 4 = 0$

$x^2 = -4$

$x = \pm 2i$ ← complex roots