KEY

= Unit 5 Test Review #2 =

1. Express $(-2-3i)^3$ in simplest $a+bi$ form.

$(-2-3i)(-2-3i)(-2-3i)$

$+4+6i$
$+6i+9i^2$

$4+12i-9$

$-5+12i$

$(-5+12i)(-2-3i)$

$10+15i$
$-24i-36i^2$

$10-9i+36$

$\boxed{46-9i}$

2. What is the solution set of $\sqrt{x+6}-x=4$?

$+x \quad +x$

$(\sqrt{x+6})^2=(x+4)^2$

$x+6=x^2+8x+16$

$0=x^2+7x+10$

$0=(x+5)(x+2)$

$x=-5 \quad x=-2$

CHECK:

$\sqrt{(-5)+6}-(-5)\stackrel{?}{=}4$ No!

$\sqrt{(-2)+6}-(-2)\stackrel{?}{=}4$ YES!

$\{-2\}$

3. Determine the inverse of $f(x)=\frac{2}{3}x+1$. Use compositions to prove that you are correct.

$y=\frac{2}{3}x+1$

$x=\frac{2}{3}y+1$

$x-1=\frac{2}{3}y$

$3(x-1)=2y$

$\frac{3(x-1)}{2}=y$

$\frac{3(x-1)}{2}=f^{-1}(x)$

$f(f^{-1}(x))=x$

$f\left(\frac{3(x-1)}{2}\right)=x$

$\frac{2}{3}\left(\frac{3(x-1)}{2}\right)+1=x$

$x-1+1=x$

$x=x$ ✓

$f^{-1}(f(x))=x$

$f^{-1}\left(\frac{2}{3}x+1\right)=x$

$\frac{3\left(\left(\frac{2}{3}x+1\right)-1\right)}{2}=x$

$\frac{2x+1-1}{2}=x$

$\frac{2x}{2}=x$

$x=x$ ✓

4. Solve $9x^2+112=0$ and express your answer in simplest radical form.

$\frac{9x^2}{9}=\frac{-112}{9}$

$x^2=-\frac{112}{9}$

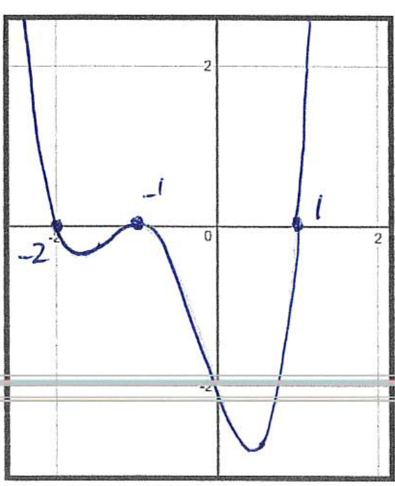
$x=\pm\sqrt{-\frac{112}{9}}$

$x=\pm i\sqrt{\frac{112}{9}}$

$x=\pm i\frac{\sqrt{64}\sqrt{2}}{\sqrt{9}}$

$\boxed{x=\frac{\pm 8i\sqrt{2}}{3}}$

5. Determine the equation in standard form for the graph shown:



POSITIVE, EVEN DEGREE

ROOTS...	FACTORS...
-2	$(x+2)$
-1	$(x+1)^2$
1	$(x-1)$

So...

$y=(x+1)^2(x+2)(x-1)$

$y=(x^2+2x+1)(x+2)(x-1)$

x^3+2x^2+1x
$+2x^2+4x+2$

x^3+4x^2+5x+2

$y=(x^3+4x^2+5x+2)(x-1)$

$=x^4+4x^3+5x^2+2x$
$-1x^3-4x^2-5x-2$

$\boxed{y=x^4+3x^3+1x^2-3x-2}$

TURN OVER

6. If $f(x) = 2x^2 - 10x$ and $g(x) = x - 3$, evaluate $f(g(x))$ and $(g \circ f)(x)$

$f(g(x))$

$f(x-3) = 2(x-3)^2 - 10(x-3)$

$= 2(x^2 - 6x + 9) - 10(x-3)$

$= 2x^2 - 12x + 18 - 10x + 30$

$= 2x^2 - 22x + 48$

$(g \circ f)(x) = g(f(x))$

$g(2x^2 - 10x) = (2x^2 - 10x) - 3$

$= 2x^2 - 10x - 3$

7. Determine the inverse of $f(x) = -\frac{2}{3}x - 9$

$y = -\frac{2}{3}x - 9$

$x = -\frac{2}{3}y - 9$

$x + 9 = -\frac{2}{3}y$

$3(x+9) = -2y$

$\frac{3(x+9)}{-2} = \frac{-2y}{-2}$

$-\frac{3(x+9)}{2} = y$

$-\frac{3(x+9)}{2} = f^{-1}(x)$

8. Solve algebraically for the exact values of x: $\frac{x}{x-1} - \frac{2}{x} = \frac{1}{x-1}$

$\left(\frac{x}{x}\right)\frac{x}{x-1} - \frac{2(x-1)}{x(x-1)} = \frac{1}{x-1}\frac{(x)}{(x)}$

$\frac{x^2}{\cancel{x(x-1)}} - \frac{2x-2}{\cancel{x(x-1)}} = \frac{x}{\cancel{x(x-1)}}$

$x^2 - 2x + 2 = x$

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$

$x = 2 \quad x = 1$, BUT $x \neq 1$, SO... $\{2\}$

9. Express in simplest form: $\sqrt[3]{-\frac{27x^{10}y^5}{81xy}}$

$\frac{\sqrt[3]{-27}\ \sqrt[3]{x^{10}}\ \sqrt[3]{y^5}}{\sqrt[3]{81}\ \sqrt[3]{x}\ \sqrt[3]{y}}$

$\frac{-\cancel{3}x^3\cancel{\sqrt[3]{x}}\ y\sqrt[3]{y^2}}{\cancel{3}\sqrt[3]{3}\ \cancel{\sqrt[3]{x}}\ \sqrt[3]{y}}$

$\boxed{-\frac{x^3y\sqrt[3]{y}}{\sqrt[3]{3}} \qquad -x^3y\sqrt[3]{\frac{y}{3}}}$

10. Classify the symmetry of $f(x) = -2x^9 + 4x^3 - 8x + 1$ as even, odd, or neither. Justify your answer.

EVEN: $f(x) = f(-x)$

$-2x^9 + 4x^3 - 8x + 1 \stackrel{?}{=} -2(-x)^9 + 4(-x)^3 - 8(-x) + 1$

$-2x^9 + 4x^3 - 8x + 1 \neq 2x^9 - 4x^3 + 8x + 1$

NOT EVEN

ODD: $f(x) = -f(-x)$

$-2x^9 + 4x^3 - 8x + 1 = -(2x^9 - 4x^3 + 8x + 1)$

$-2x^9 + 4x^3 - 8x + 1 \neq -2x^9 + 4x^3 - 8x - 1$

NOT ODD

$\boxed{\text{NEITHER}}$

11. Determine if ~~$x + 3$~~ $x - 3$ is a factor of $x^3 + 2x^2 - 5x - 6$. Justify your answer.

~~FACTOR $x-3$~~

ROOT $+3$

$+3$	1	2	-5	-6
	↓	$+3$	15	30
	1	5	10	24

SINCE THE REMAINDER IS NOT 0, $x-3$ IS NOT A FACTOR OF $x^3 + 2x^2 - 5x - 6$.

TURN OVER