Practice for Units 6 & 7 Name Key

Station 1 – Even and Odd Functions

Read and answer the questions on the back.

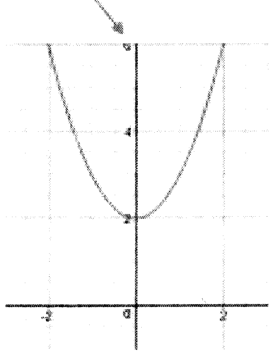
A **Function** can be classified as ***Even, Odd*** or ***Neither***. This classification can be determined *graphically* or *algebraically*.

Graphical Interpretation -

Even Functions:

Have a graph that is symmetric with respect to the **Y-Axis.**

Y-Axis – acts like a mirror

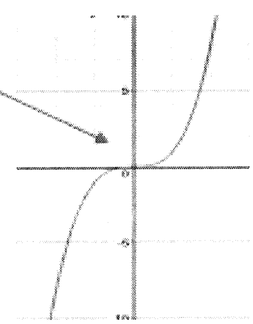


Odd Functions:

Have a graph that is symmetric with respect to the **Origin**.

Origin – If you spin the picture upside down about the Origin, the graph looks the same!

Origin



Algebraic Test – Substitute $(-x)$ in for x everywhere in the function and analyze the results of $f(-x)$, by comparing it to the original function $f(x)$.

Even Function: $y = f(x)$ is ***Even*** when, for each x in the domain of $f(x)$, $f(-x) = f(x)$

Odd Function: $y = f(x)$ is ***Odd*** when, for each x in the domain of $f(x)$, $f(-x) = -f(x)$

Examples:

a. $f(x) = x^2 + 4$

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

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

$f(-x) = f(x)$

Even Function!

b. $f(x) = x^3 - 2x$

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

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

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

Odd Function!

c. $f(x) = x^2 - 3x + 4$

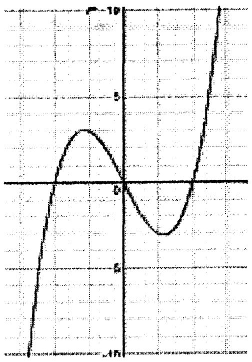
$f(x) = (-x)^2 - 3(-x) + 4$

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

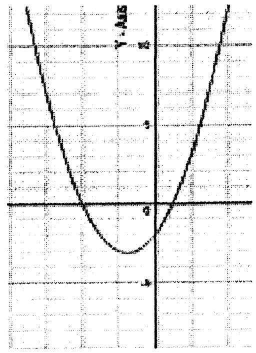
$f(-x) \neq f(x) \neq -f(x)$

Neither!

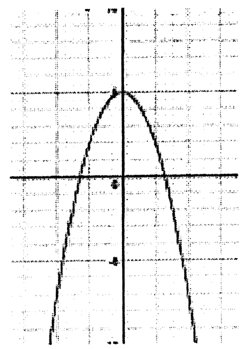
A. Graphically determine whether the following functions are Even, Odd, or Neither

1. 

odd
symmetric
about the
origin

2. 

neither

3. 

even
symmetric
about the
y-axis

B. Algebraically determine whether the following functions are Even, Odd, or Neither

1. $f(x) = x^3 - x^2 + 4x + 2$

$f(-x) = (-x)^3 - (-x)^2 + 4(-x) + 2$ neither

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

2. $f(x) = -x^2 + 10$

$f(-x) = -(-x)^2 + 10$ even

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

3. $f(x) = x^3 + 4x$

$f(-x) = (-x)^3 + 4(-x)$ odd

$-x^3 - 4x$ $-f(x) = f(-x)$

4. $f(x) = -x^3 + 5x - 2$

$f(-x) = -(-x)^3 + 5(-x) - 2$ neither

$x^3 - 5x - 2$

C. If $f(x)$ is an odd, one-to-one function with $f(5) = -2$ then which point *must* lie on the graph of its inverse $f^{-1}(x)$?

$\to (5,-2)$
$(-5,2) \leftarrow$ odd

inverse = swap
x & y

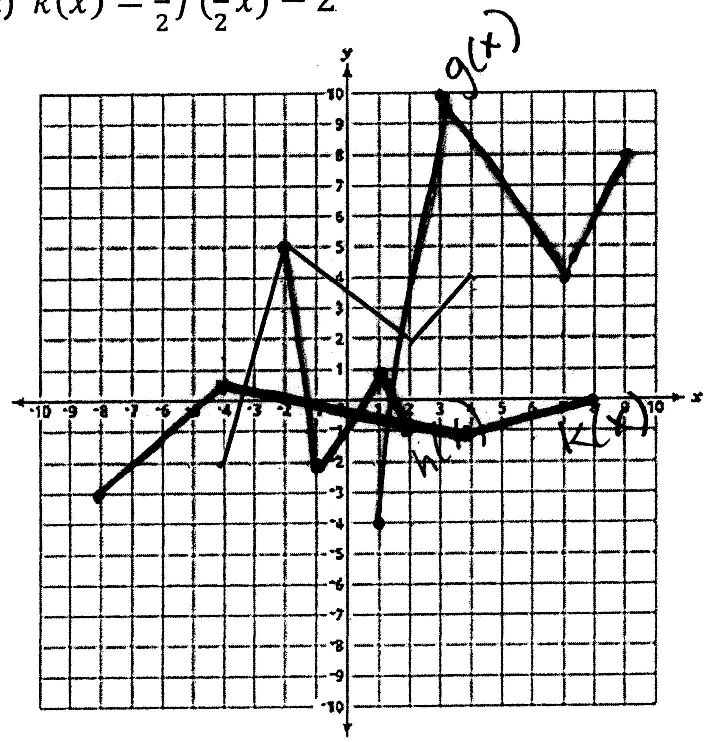
(1) $(5,-2)$ (2) $(2,-5)$ (3) $(-5,2)$ (4) $(2,5)$

$(-2,5)$
$(2,-5)$

Station 2 - Transformations

1. Given the graph of $f(x)$, sketch and the label the graph of the following functions using a different color for each.

a) $g(x) = 2f(x-5)$
b) $h(x) = -f(2x) + 3$
c) $k(x) = \frac{1}{2}f(\frac{1}{2}x) - 2$



Transformations of the graphs of functions	
$f(x)+c$	shift $f(x)$ up c units
$f(x)-c$	shift $f(x)$ down c units
$f(x+c)$	shift $f(x)$ left c units
$f(x-c)$	shift $f(x)$ right c units
$f(-x)$	reflect $f(x)$ about the y-axis
$-f(x)$	reflect $f(x)$ about the x-axis
$cf(x)$	When $0<c<1$ – vertical shrinking of $f(x)$ When $c>1$ – vertical stretching of $f(x)$ Multiply the y values by c
$f(cx)$	When $0<c<1$ – horizontal stretching of $f(x)$ When $c>1$ – horizontal shrinking of $f(x)$ Divide the x values by c

2. If $f(x) = x+10$ and $g(x) = f(2x)$ then $g(-3) =$

(1) 7
(2) 2
(3) −30
(4) 4

$g(-3) = f(2 \cdot -3)$
$= f(-6)$
$f(-6) = -6 + 10$
$= 4$

3. Suppose the point $(6,-1)$ is a point of the graph of $f(x)$. For each of the following, state the coordinate of the point after the transformation.

a) $y = f(3x)$ (2,-1)

b) $y = f(x+2)$ (4,-1)

c) $y = f(x) + 5$ (6,4)

d) $y = \frac{1}{2}f(x) - 3$ (6,-3.5)

e) $y = -4f(x-1) + 2$ (7,6)

f) $y = f\left(-\frac{1}{3}x\right) - 7$ (-18,-8)

Station 3 - Solving Equations

a + bi

Real Part Imaginary Part $\sqrt{-1}$

1. Solve the equation. Leave answers in simplest a + bi form.

$$8x^2+4x+5=0$$

$$x=\frac{-4\pm\sqrt{(4)^2-4(8)(5)}}{2(8)}$$

$$=\frac{-4\pm\sqrt{-144}}{16}=\frac{-4\pm12i}{16}=-\frac{1}{4}\pm\frac{3}{4}i$$

2. Solve the equation. Check for extraneous solutions.

$$\sqrt{x+2}-3=2x$$

$$\sqrt{x+2}^{\,2}=(2x+3)^2$$

$$x+2=4x^2+12x+9$$

$$4x^2+11x+7=0$$

$$x=\frac{-11\pm\sqrt{(11)^2-4(4)(7)}}{2(4)}$$

$$x=\frac{-11\pm\sqrt{9}}{8}$$

$$x=\frac{-11\pm3}{8}$$

$$x=-1,\ \cancel{-\frac{7}{4}}$$

check

$$\sqrt{-1+2}-3=2(-1)$$

$$1-3=-2\ ✓$$

$$\sqrt{-\frac{7}{4}+2}-3=2\left(-\frac{7}{4}\right)$$

$$-2.5\neq-3.5$$

3. Solve the equation.

$$\frac{3(x+3)^{\frac{3}{4}}}{3}=\frac{81}{3}$$

$$\left((x+3)^{\frac{3}{4}}\right)^{4/3}=(27)^{4/3}$$

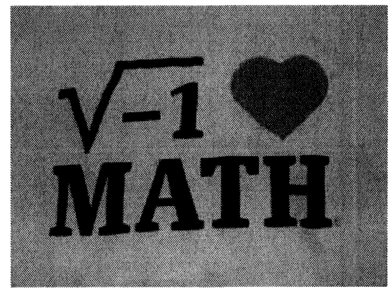
$$x+3=81$$

$$x=78$$

check

$$3(78+3)^{\frac{3}{4}}=81$$

$$3(81)^{3/4}=81\ ✓$$



Station 4 - Radicals and Powers of i

1) What is the product of $\sqrt[3]{4a^2b^4}$ and $\sqrt[3]{16a^3b^2}$?

a. $4ab^2\sqrt[3]{a^2}$

b. $4a^2b^3\sqrt[3]{a}$

c. $8ab^2\sqrt[3]{a^2}$

d. $8a^2b^3\sqrt[3]{a}$

$\sqrt[3]{64a^5b^6}$

$4ab^2\sqrt[3]{a^2}$

2) Given i is the imaginary unit, $(2-yi)^2$ in simplest form is

a. $y^2-4yi+4$

b. $-y^2-4yi+4$

c. $-y^2+4$

d. y^2+4

$4-4yi+y^2i^2$
(-1)

$-y^2-4yi+4$

3) The expression $3\sqrt{-18}+5\sqrt{-12}$ is equivalent to

a. $9\sqrt{2}i+10\sqrt{3}i$

b. $6\sqrt{2}i+7\sqrt{3}i$

c. $19\sqrt{5}i$

d. $-90\sqrt{6}$

$3(3\sqrt{2}i)+5(2\sqrt{3})i$

$9\sqrt{2}i+10\sqrt{3}i$

4) What is the sum of $5-3i$ and the conjugate of $3+2i$?

a. $2+5i$

b. $2-5i$

c. ~~$8+5i$~~

d. $8-5i$

conjugate

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

$8-5i$

5) Simplify

a) $6i^{40}\cdot 2i^{113}\cdot 3i^{223}$

$\frac{376}{4}=94.0$

$36i^{376}$
(i^0)

$=36$

b) $2i(-3i^3)^3$

$2i(-3(-i))^3=2i(3i)^3=2i(27(-i))$

$=54(-i^2)$

$=54(-(-1))=54$

c) $6i^{40}+2i^{113}+3i^{223}$

$6(i^0)+2(i^1)+3(-i)$

$6+2i-3i$

$6-i$

6) **State the domain of $y=\sqrt{2x+6}$**

$2x+6\geq 0$

$2x\geq -6$

$x\geq -3$

7) Simplify. Rationalize the denominator.

a) $\frac{2-5\sqrt{5}}{4\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{2\sqrt{13} - 5\sqrt{65}}{4(13)} = \frac{2\sqrt{13} - 5\sqrt{65}}{52}$

b) $\frac{2-\sqrt{3}}{4+\sqrt{3}} \cdot \frac{4-\sqrt{3}}{4-\sqrt{3}} = \frac{8 - 2\sqrt{3} - 4\sqrt{3} + 3}{16 - 3} = \frac{11 - 6\sqrt{3}}{13}$

c) $\frac{5\sqrt{2}+\sqrt{3}}{5-5\sqrt{2}} \cdot \frac{5+5\sqrt{2}}{5+5\sqrt{2}} = \frac{25\sqrt{2} + 50 + 5\sqrt{3} + 5\sqrt{6}}{25 - 50}$

$= \frac{25\sqrt{2} + 50 + 5\sqrt{3} + 5\sqrt{6}}{-25}$

$= \frac{5\sqrt{2} + 10 + \sqrt{3} + \sqrt{6}}{-5}$

8) **Simplify completely.**

a) $\sqrt{169x^{10}y^{12}}$

$13x^5y^6$

b) $5x^2\sqrt{18x^7}$

$(5x^2)(3\sqrt{2})(x^3\sqrt{x})$

$15x^5\sqrt{2x}$

c) $\sqrt[3]{72x^7y^{14}}$

$2\sqrt[3]{9}\ x^2\sqrt[3]{x}\ \ y^4\sqrt[3]{y^2}$

$2x^2y^4\sqrt[3]{9xy^2}$

d) $\sqrt[5]{64x^{45}y^{11}}$

$2x^9y^2\sqrt[5]{y}$

Station 5 – Discriminant

The discriminant is a small part of the quadratic formula.

$$b^2 - 4ac$$

Find the discriminant to determine the number of x-intercepts and the nature of the roots.

1. $2x^2 - 3x + 2 = 0$

$b^2 - 4ac$

$(-3)^2 - 4(2)(2) = -7 \Rightarrow$ imaginary, unequal
no x-int

2. $3x + 7 = 5x^2 - 4$

$5x^2 - 3x - 11 = 0$

$(-3)^2 - 4(5)(-11) = 229 \Rightarrow$ real, irrational, unequal
2 x-int

3. $9x^2 + 24x + 16 = 0$

$(-24)^2 - 4(9)(16) = 0 \Rightarrow$ real, rational, equal
1 x-int

4. $x^2 - 7x + 6 = 0$

$(-7)^2 - 4(1)(6) = 25 \Rightarrow$ real, rational, unequal
2 x-int

Challenge:

5. Find all the values of c such that $2x^2 - 6x + c = 0$ has unequal, imaginary roots.

$b^2 - 4ac < 0$

$(-6)^2 - 4(2)(c) < 0$

$36 - 8c < 0$

$-8c < -36$

$c > 4.5$

Station 6 - Review

1. Which of the following represents the trinomial $7x^2 + 16x - 15$ written as a product?

   1) $(x-5)(7x+3)$ 3) $(x-3)(7x+5)$

   2) $(x+3)(7x-5)$ 4) $(x+5)(7x-3)$

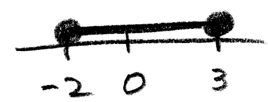
2. Which number line below represents the solution set of the inequality $x^2 - x - 6 \leq 0$?

   1) $-3 \leq x \leq 2$ 3) $x \leq -3$ or $x \geq 2$

   2) $x \leq -2$ or $x \geq 3$ 4) $-2 \leq x \leq 3$

$(x-3)(x+2) = 0$

$x = 3 \quad x = -2$



3. Find the Inverse of $g(x) = 2x - 3$.

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

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

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

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

$y = 2x - 3$

$x = 2y - 3$

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

4. For the piecewise function $f(x) = \begin{cases} 3x+1 & -5 \leq x < 2 \\ -2x-5 & 2 \leq x < 5 \\ \frac{x+8}{2} & 5 \leq x \leq 10 \end{cases}$ which of the following represents $f(2)$?

$f(2) = -2(2) - 5$
$= -9$

   1) -9 2) -8 3) -3 4) 1

5. Evaluate: $3\sum_{x=2}^{4}(x^2 - 5)$ $= 42$

$3\left(((2)^2 - 5) + ((3)^2 - 5) + ((4)^2 - 5)\right)$

$3(-1 + 4 + 11)$

$3(14)$