Key

Algebra II SOL Review: Functions and Statistics

SOL AII.6 **The student will recognize the general shape of functions (absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.**

Hints and Notes

Functions:

- Absolute Value. $y = |x|$ Looks like a "V". If positive, goes up.
- Square Root $y = \sqrt{x}$ Has a definite starting point.
- Quadratic $y = x^2$ "U" shape Can go up or down
- Exponential $y = 2^x$ "variable in exponent"
- Logarithmic $y = \log x$ Inverse of exponential equation
- Rational Function $y = \dfrac{p(x)}{q(x)}$ "Horizontal & Vertical asymptotes"
- Polynomial Function – $y = ax^n + bx^{n-1} + cx^{n-2} + \ldots$ decreasing powers
- Transformations:

Remember horizontal shifts are the opposite of the sign

$y = |x-2|$ Shifts 2 units to the right

$y = |x+2|$ Shifts 2 units to the left

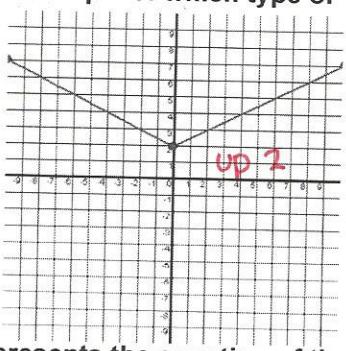
Vertical shift is at the end of your function & moves the same

$y = |x| + 2$ Shift vertex up 2

$y = |x| - 2$ Shift vertex down 2

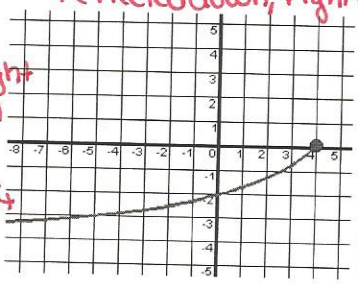
PRACTICE AII.6

1. The graph below is an example of which type of function?



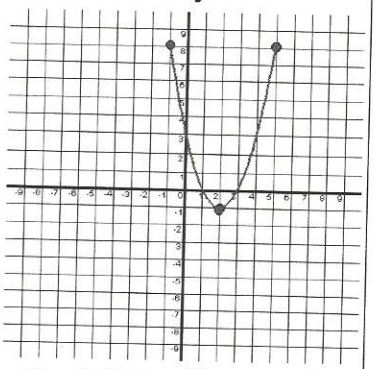
A Absolute Value
B Exponential
C Linear
D Quadratic

2. Which most likely represents the equation of the graph



A $y = \sqrt{4-x}$ Right 4
B $y = -\sqrt{4-x}$
C $y = -\sqrt{4+x}$
D $y = \sqrt{4+x}$ left 4

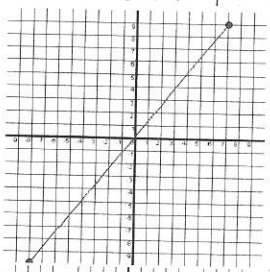
3. Which of the following is most likely the equation graphed

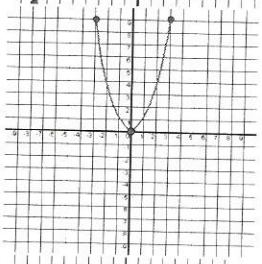


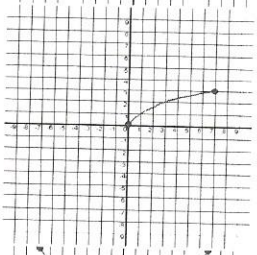
A $y = (x+2)^2 + 1$
B $y = 5(x-1)^2 - 2$
C $y = (x-2)^2 + 2$
D $y = (x-2)^2 - 1$

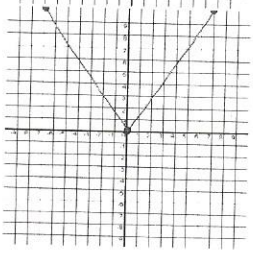
4. Which sketch could represent the graph of the function

$f(x) = |x-a|$ ← Absolute Value

A.  Linear

B.  Quadratic

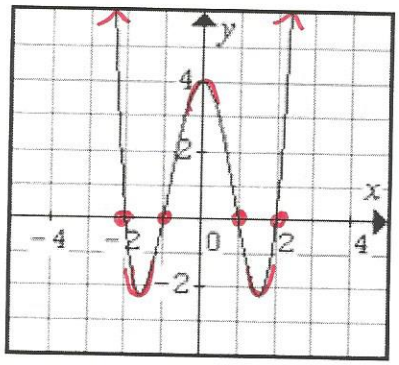
C.  Square Root

D.  Absolute Value

Key

5. **This is a portion of the graph of a polynomial function. If written in order of descending powers, which could be the first term of the polynomial?**

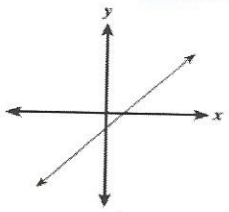
A x^2
B x^3
C x^4
D x^5



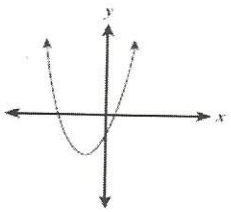
- 4 real zeros
- 3 turns
- Same end behavior so the function is even

6. **Which could be the graph of $f(x) = ax^3 + bx^2 + cx + d$ if a, b, c, and d are real numbers and $a < 0$?**

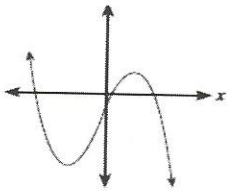
A.



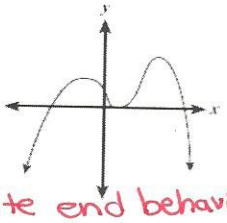
B.



C.



D.



- Degree = 3 so opposite end behavior
- $a < 0$ so the right hand side of the graph should point down

Algebra II SOL Review: Functions and Statistics

Edited from VBCPS "Review Skills Notes Practice 2.11a"

SOL AII.7 The student will investigate & analyze functions algebraically & graphically. Key concepts include:

- **domain and range, including limited and discontinuous domains and ranges;**
- **zeros;**
- ***x*- and *y*-intercepts;**
- **intervals in which a function is increasing or decreasing;**
- **asymptotes;**
- **end behavior;**
- **inverse of a function; and**
- **composition of multiple functions.**

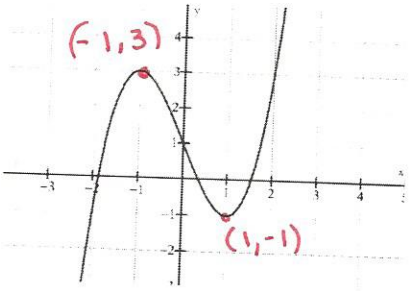
HINTS AND NOTES

- **Domain:** x values **Range:** y values
- **To be a function:** No two x's are the same or it passes the vertical line test
- **Zero** (root, solution, x-intercept) of a function: (where your graph crosses the x-axis)
- **To find composite functions:** *f(g(x))* Substitute the entire inner function into the outer function in the x position
- **To find inverse of a function:** Change notation to y=, switch x & y, Solve for y, Inverse ($f^{-1}(x)$) will be what y =
- **On a graph:** turning point – point where your function turns the corner and switches direction
  interval increasing – region on graph where y values are increasing
  interval decreasing – region on the graph where y values are decreasing
- **Asymptotes:** Vertical & Horizontal
  - Vertical: Look at denominator (whatever makes $x = 0$) x = ?
  - Horizontal:
    - same power – $y = \frac{\text{leading coefficient}}{\text{leading coefficient}}$
    - higher power below – no horizontal asymptote
    - higher power above – $y = 0$
- **End Behavior:** Look at your graph and your question. It will ask you what y value you are approaching as x approaches a given value. If it is a rational function, you are always approaching your horizontal asymptote. Use your calculator !!

PRACTICE AII.7

Key

1. This is a portion of the graph of a polynomial function. Apparently the function has a turning point at



A $(-1,-2)$
B $(-1,3)$
C $(0,1)$
D $\left(\frac{1}{4},0\right)$

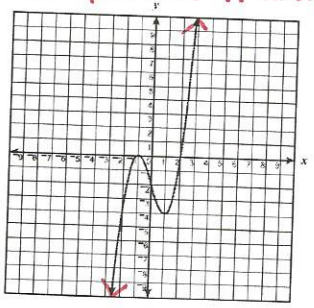
2. Which describes the end behavior of the function $f(x)=x^3-4x^2+4x$ as *x* approaches infinity?

↖ means the right hand side of the graph ↗

A *y* approaches ∞
B *y* approaches 0
C *y* approaches $-\infty$
D *y* approaches 2

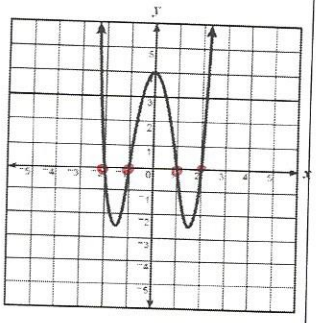
3. This is a portion of the graph of a polynomial function. Apparently the function has a domain of

all possible x values



A $\{x|x=\mathbb{R}\}$
B $\{x|x>0\}$
C $\{y|y>0\}$
D $\{x|-9<x<10\}$

4. This is a portion of the graph of a polynomial function. This function apparently has the following types of roots



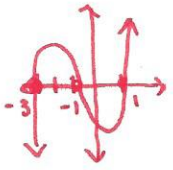
A 5 different real roots
B 4 different real roots
C 2 real & 2 imaginary
D no real roots

x-intercepts show real roots

5. Which value is *not* a zero of $P(x)=x^3+3x^2-x-3$

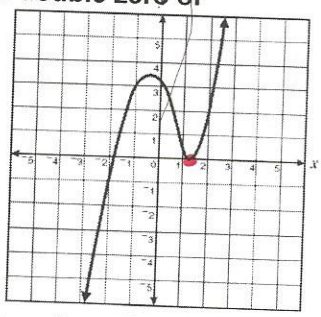
A 1
B -1
C 3
D -3

Degree is 3 so there are 3 total zeros.



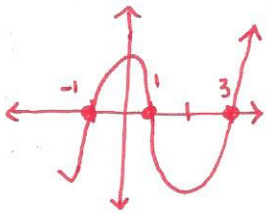
all 3 are real zeros

6. This is portion of a polynomial function. Apparently the function has a double zero of



A between -2 and -1
B between -2 and 1
C between 1 and 2
D between 3 and 4

7. The polynomial function $f(x)=x^3-3x^2+x+1$ has a zero between



A -4 and -3
B -2 and -1
C -1 and 0
D 3 and 4

8. If the domain of $f(x)=2x^2-3$ is limited to $\{-3,-1,1,3\}$, what is the range?

A $\{-21,-5,-1,15\}$
B $\{-21,15\}$
C $\{-1,15\}$
D $\{1,5,15,21\}$

x	y
-3	15
-1	-1
1	-1
3	15

9. If $f(x)=x^2-2x$ and $g(x)=x-3$, which if the following expressions represents $g(f(x))$?

A x^3-5x^2+6x
B x^2-2x-3
C x^2-3x-3
D x^2-8x+9

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

10. If $f(x)=5x^2-7$ what is $f(-3)$?

A -52
B -22
C 38
D 45

$f(-3)=5(-3)^2-7$
$=5(9)-7$
$=45-7$
$=38$

11. Which function represents the inverse of the function $f(x)=x+2$

A $f^{-1}(x)=x-2$
B $f^{-1}(x)=-x-2$
C $f^{-1}(x)=-x+2$
D $f^{-1}(x)=-(x+2)$

$y=x+2$
$x=y+2$
$-2 \quad -2$
$x-2=y$
$f^{-1}(x)=x-2$

Key

Algebra II SOL Review: Functions and Statistics

Edited from VBCPS "Review Skills Notes" October 2011

SOL AII.8 The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression

HINTS AND NOTES

Solutions of equation, **zeros** of a function, **roots** of the equation, and **x-intercepts** all refer to the **same thing**: Where is the value of my function equal to zero?

If zeros are ***a,b,c*** Then factors are $(x-a)(x-b)(x-c)$

PRACTICE AII.8

1. **Which is a zero of $f(x)=x^2+x-6$?**

   A -3
   B -2
   C 0
   D 3

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

   $0=x-2$ $+2$ $+2$ $\quad 2=x$

   $0=x+3$ -3 -3 $\quad -3=x$

2. **A polynomial function has a zero at $x=-4$. Which expression must be a factor of the polynomial?**

   The factor would be $(x--4)=(x+4)$

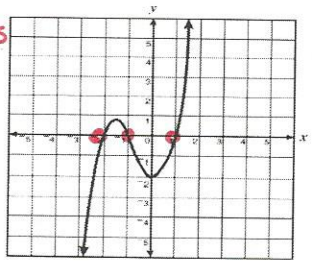
   A. $x-4$
   B. $x-2$
   C. $x+2$
   D. $x+4$

3. **Which of the following functions has x-intercepts of -2 and 1**

   A $f(x)=x^2-x-2$ x intercepts -1 and 2
   B $f(x)=x^2+x-2$ -2 and 1
   C $f(x)=x^2-2x+1$ 1 and 1 (double root)
   D $f(x)=2x-1$ $\frac{1}{2}$

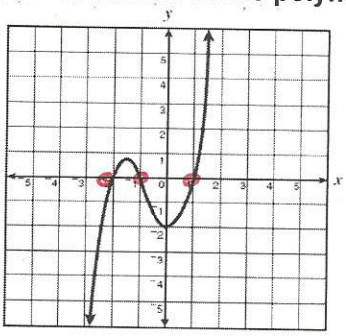
4. **Which of the following sets contains all the apparent zeroes for the function shown?**

   ↑ x-intercepts

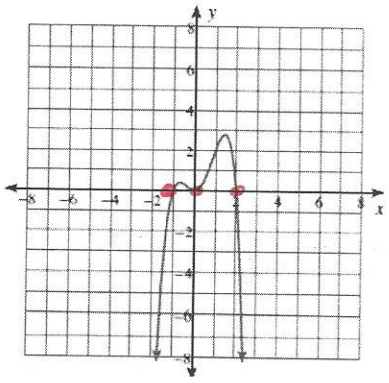
   A $\{1\}$
   B $\{-2,0,2\}$
   C $\{-2,-1,1\}$
   D $\{-2,-1,0,1\}$

5. **A section of the graph of the polynomial function with integral roots is shown. Which of the following sets most likely contain only elements that are factors of the polynomial?**

   A $\{(x-2),(x-1.5)\}$
   B $\{(x-2),(x-1),(x+1)\}$
   C $\{(x+2),(x+1),(x-1)\}$
   D $\{x,(x-2),(x-1),(x+1)\}$

6. **Which of the following sets contains all the apparent zeroes for the function**

   A $\{-2,2\}$
   B $\{0\}$
   C $\{-1,0,2\}$
   D $\{-2,-1,0,1.5,2\}$