JEDDAH KNOWLEDGE INTERNATIONAL SCHOOL

GRADE 11 PRECALCULUS

2020-2021

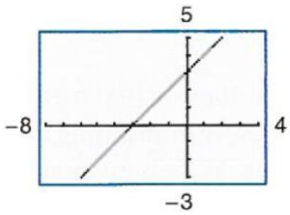
Name: ________________________________

Section: ________________________________

Functions

1. Identify the parent function and describe the transformation shown in the graph. Write an equation of the graphed function.

1.



I. Parent function:

……………………………………

……………………………………

II. Describe the transformation:

……………………………………

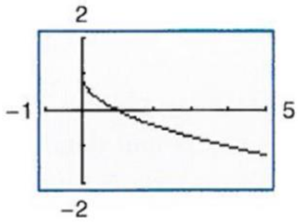
……………………………………

III. The equation of the graphed function:

……………………………………

……………………………………

2.



I. Parent function:

……………………………………

……………………………………

II. Describe the transformation:

……………………………………

……………………………………

III. The equation of the graphed function:

……………………………………

……………………………………

2. Compar the graph of the function with the graph of its parent function:

a. $y = x^2 + 1$

I. Parent function:

II. Description:

b. $y = |x - 1|$

I. Parent function:

II. Description:

c. $y = 2x^2$

I. Parent function:

II. Description:

d. $y = -x^3$

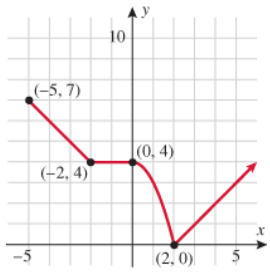
I. Parent function:

II. Description:

3.	Given the following functions. Find out $f\left(g(x)\right)$ and $g\left(f(x)\right)$.	
	a. $f(x) = 4x - 7$ $g(x) = \frac{x+7}{4}$	$f\left(g(x)\right)=$
		$g\left(f(x)\right)=$
	What do you conclude?	
	b. $f(x) = x^2 + 6, x \leq 0$ $g(x) = \sqrt{x-6}$	$f\left(g(x)\right)=$
		$g\left(f(x)\right)=$
	What do you conclude?	

4. Determine the open intervals over which the function is decreasing, increasing or constant:

a.



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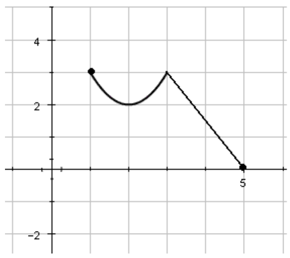
b.



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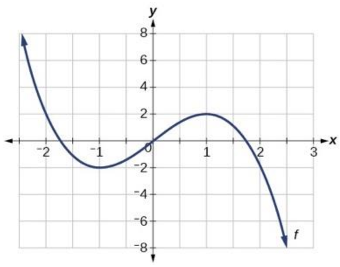
5. Find the domain and the range of the given functions:

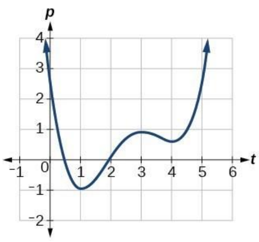
a.



Domain: ………………………………………

Range: ……………………………………

b.



Domain: ………………………………………

Range: ……………………………………

6. Given $f(x) = \begin{cases} x^3 - 2, & x < 0 \\ x - 2 \quad , & 0 \leq x \leq 3 \\ 1, & x > 3 \end{cases}$

<u>Find:</u>

a. $f(0) =$ _________

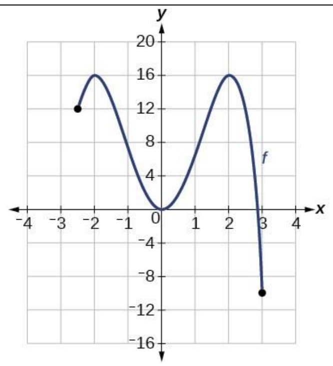
b. $f(-1) =$ ________

c. $f(3) =$ _________

d. $f(2)$=____________

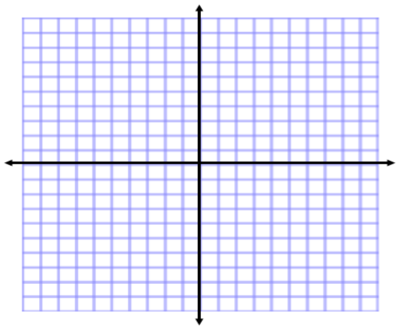
e. $f(5) =$ _________

f. $f(10) =$ _________

7.	Use the graph below to answer the following:  **a)** Estimate $f(1)$ **b)** Estimate the $x - intercepts.$ **c)** List the $y - intercept.$ **d)** Does the function *f* appear to be even or odd or neither? **e)** Estimate the intervals where *f* is increasing **f)** Estimate the intervals where *f* is decreasing **g)** Find the relative minimum and maximum points. **h)** Estimate the domain and range of *f*.
8.	Find the domain of the function $f(x) = \sqrt{x-5}$ algebraically.

9. Graph the following piecewise function.

$$f(x) = \begin{cases} 2, & x \le 0 \\ x + 2, & 0 < x \le 3 \\ x^2 - 4, & x > 3 \end{cases}$$



10. For the function $f(x) = 3x^3 + 1$ determine whether the function is even , odd or neither using :

Algebraically	Graphically	Numerically

Exponential functions

11.

a. Without a calculator, substitute each given x value below into the equation: $f(x) = 2^x$. Fill in the table.

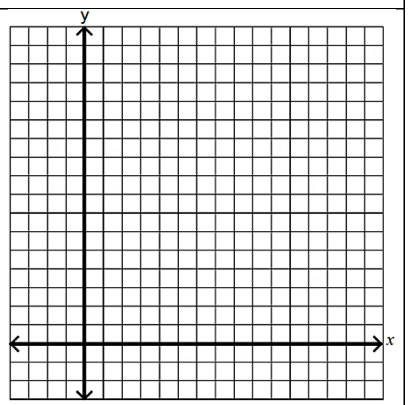
x	-2	-1	0	1	2	3	4
y							

b. Using the table above, draw the graph of $f(x) = 2^x$. on the coordinate plane below:

c. Using a graphing calculator, draw the graph of e^x on the same set of axes above. Label your graphs accordingly

Domain:

Range:



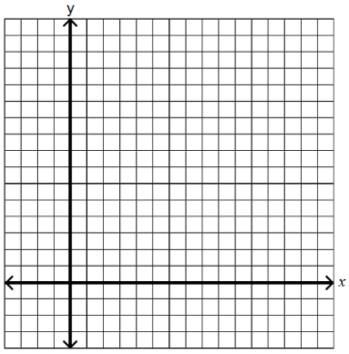
d. Explain with use of calculations why the graph $f(x) = 1^x$ is a horizontal line.

e. Name two types of real-world applications for the use of exponential equations.

12.	Ali starts an investment with a bank that offers 5% <u>compound interest</u> per month. This is a fixed term investment, such that he will only be able to withdraw the money after 5 years. He invests 50,000 SAR at the beginning.
	a. For how many months will this investment gain interest?
	b. Write a suitable mathematical formula to describe the scenario above.
	c. Use your formula to calculate the total amount that Ali will have in this account at the end of 5 years.
	d. How much of this total money is <u>interest</u> earned?
13.	A computer scientist generates a statistical model that predicts that a virus will spread at an <u>exponential rate</u> every <u>week</u>. If initially 4 people are reported to have the virus during week 1, how many people should theoretically have contracted the virus <u>at the end of 12 weeks</u>? Answer:………………..
14.	Fill in the table below:
15.	Find the inverse of a. $f(x) = log_2 x$. b. $f(x) = 5^x$.

Exponential form	Logarithmic form
$6^2 = 36$	
$5^3 = 125$	
	$\text{Log}_3 81 = 4$
	$\text{Log}_{11} \frac{1}{121} = -2$

16. Draw the graph of $f(x) = log_2 x$ <u>and its inverse</u> on the same set of axes, using the coordinate plain below: Label each graph accordingly.



If $f(x) = log_2 x$ is shifted 3 units up and 4 units to the left, what will be the new equation for the function?

17. <u>Without a calculator</u>, change the base in each question below and fill in the table:

logarithm	**base 10**	**base *e***	**Answer**
$Log_2 64$		$\frac{\ln 64}{\ln 2}$	6
	$\frac{\log_{10} 625}{\log_{10} 5}$		
		$\frac{\ln 343}{\ln 7}$	
			4

Use your imagination!

18. Solve the following:

a. $3^x = 243$

b. $4(2^{3x-2}) - 3 = 5$

c. $e^{2x} + 4e - 12 = 0$

Sequences:

19. What are the next four terms of the arithmetic sequence 10, 13, 16, ... ?

20. Find the sum of each arithmetic series.

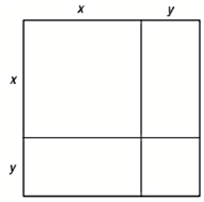
a. $\sum_{j=1}^{7}(4 - j)$

b. $\sum_{f=11}^{15}(4 - f)$

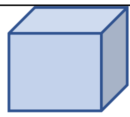
21. Find a_1 in a geometric series for which $S_n = 3045, r = \frac{2}{5}$ and a_n=120.

22. **AREA** The square shown has a side length of $x + y$. The area must therefore be

$(x + y)^2 = x^2 + xy + xy + y^2$. Each of these four terms corresponds to a different part of the area. Place each term in the corresponding region of the square.



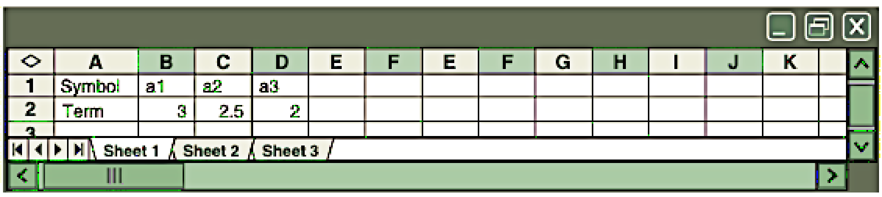
23. The length of each side of this cube is $x + y$ units.



Expand $(x + y)^3$

Make a picture similar to the one used in Exercise 1 for the cube. For the three-dimensional cube, it helps to make a blow-up version of the drawing.

24. Create a spreadsheet like the one below and enter the first three terms of a sequence. Find the first ten terms of the sequence. Then find the sum of the first ten terms of the series.



Highlight cells B2 through D2 and move your cursor to any corner of the highlighted cells until a black cross appears. Drag across the row and release it at cell K2. The next values in the sequence will appear in the cells.

To find the sum of the first 10 terms in the series, highlight the cells containing the terms, then click the ∑ symbol on the toolbar. The sum will appear in the next cell. Note that this will work for arithmetic series only. The sum of the first ten terms of this series is 7.5.

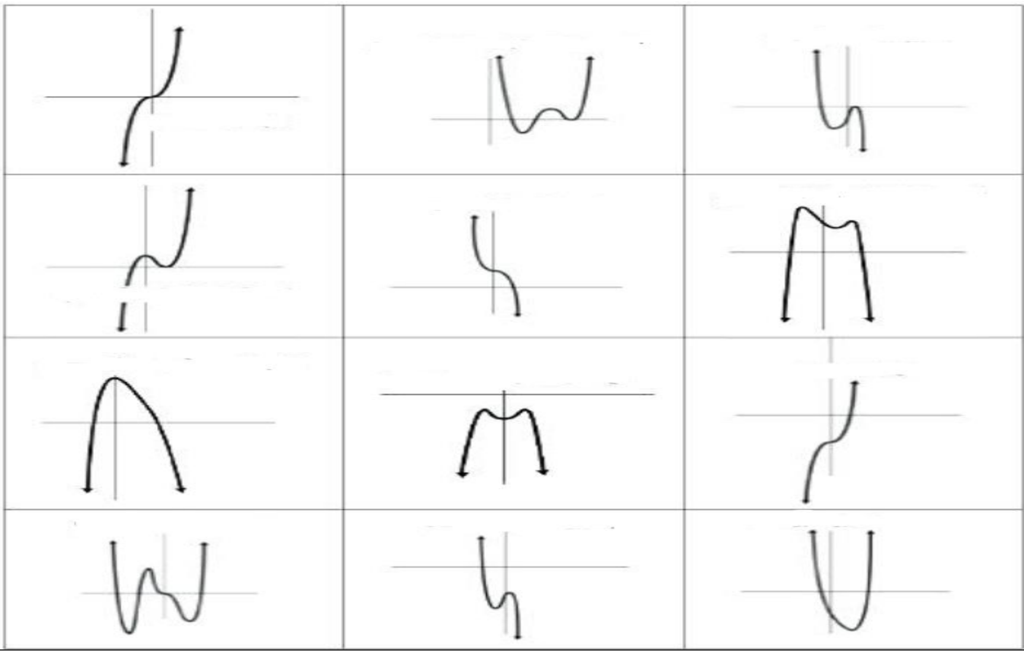
	Activity: a. Create a spreadsheet like the one in the example above. Record the initial sequence as -4, -1, and 2. Repeat the process you followed in the example. What are the next six numbers in the sequence? b. Describe the steps the spreadsheet program completes to find the next term in the sequence c. Use the spreadsheet to find the value for the 16th term in the sequence d. Find the sum of the 3rd through 13th terms in the sequence.
25.	Activity : continued fractions: The fraction below is an example of a continued fraction. Note that each fraction in the continued fraction has a numerator of 1. Change $\frac{25}{11}$ into a continued fraction follow the steps: $\frac{25}{11} = 2 + \cfrac{1}{3 + \cfrac{1}{1 + \frac{1}{2}}}$ Step 1 $\frac{25}{11} = \frac{22}{11} + \frac{3}{11} = 2 + \frac{3}{11}$ Step 2 $\frac{3}{11} = \frac{1}{\frac{11}{3}}$ (keep switch flip) Step 3 $\frac{11}{3} = \frac{9}{3} + \frac{2}{3} = 3 + \frac{2}{3}$ Step 4 $\frac{2}{3} = \frac{1}{\frac{3}{2}}$ Step 5 $\frac{3}{2} = \frac{2}{2} + \frac{1}{2} = 1 + \frac{1}{2}$ Now try:
	a. $\frac{75}{31}$ b. $\frac{29}{8}$

Polynomials:

26. State for each graph the following information:

a.) Leading Coefficient. (+/-).

b.) Highest Degree. (even/odd).



27. Fill in the required information.

	Value of H.D.	Value of L.C.	End Behaviors
1.) $f(x) = 3x^3 - 2x^2 + 5x^4 - x$			
2.) $g(x) = -x^3 + 2x^2 - 5$			
3.) $y = 2x - 5x^2 + 7$			
4.) $y = -5x + 8$			
5.) $3y = 2x - 8x^2$			
6.) $\frac{f(x)}{2} = 3x^2 - x + 5$			

Algebraic Solution

$f(x) = x^3 - x^2 - 2x$ — Write original function.

$0 = x^3 - x^2 - 2x$ — Substitute 0 for $f(x)$.

$0 = x(x^2 - x - 2)$ — Remove common monomial factor.

$0 = x(x-2)(x+1)$ — Factor completely.

So, the real zeros are

$x = 0, \quad x = 2, \quad \text{and} \quad x = -1$

and the corresponding x-intercepts are

$(0, 0), \quad (2, 0), \quad \text{and} \quad (-1, 0).$

Graphical Solution

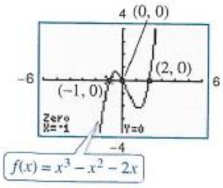
The graph of f has the x-intercepts

$(0, 0), \quad (2, 0), \quad \text{and} \quad (-1, 0)$

as shown in Figure 3.15. So, the real zeros of f are

$x = 0, \quad x = 2, \quad \text{and} \quad x = -1.$

Use the *zero* or *root* feature of a graphing utility to verify these zeros.



28.

a. $(2x^4 + 8x^3 + 7x^2 - 4x - 4)$

b. $(9x^5 + 27x^4 - 212x^3 - 708x^2 - 96x - 320)$

c. $(x^4 - 9x^3 - 5x^2 + 225x - 500)$

d. $(x^3 - 4x^2 + x - 4)$

Rational Functions and Asymptotes

$N \rightarrow$ *Numerator Highest Degree*

$D \rightarrow$ *Denominator Highest Degree*

Holes

This will occur when there is a common factor in your numerator and denominator.

$N < D$	$N = D$	$N > D$
Vertical Asymptote Set denominator = 0 and solve for x	Vertical Asymptote Set denominator = 0 and solve for x	Vertical Asymptote Set denominator = 0 and solve for x
Horizontal Asymptote $y = 0$	Horizontal Asymptote $y = \frac{Leading\ Coefficient}{Leading\ Coefficient}$	Horizontal Asymptote None
Slant Asymptote None	Slant Asymptote None	Slant Asymptote Only if Degree in Numerator is greater than Degree in Denominator by 1

29.	Find the Vertical Asymptote, Horizontal Asymptote, Slant Asymptote (if any), Holes (if any) of each graph.		
	a. $f(x) = -\frac{4}{x^2-3x}$	b. $f(x) = \frac{x-4}{-4x-16}$	c. $f(x) = \frac{x^3-9x}{3x^2-6x-9}$

30.	Divide the following polynomials either through LONG DIVISION OR SYNTHETIC.	
	a. $(4a^3 - 7a^2 - 11a + 5) \div (4a + 5)$	b. $(6d^5 + 13d^4 - 6d^3 - 12d^2 + 5d - 6) \div (2d^2 + d - 3)$

End