

Dear Prospective IB student,

Welcome to Mathematics SL! Attached are two assignments that you need to complete over the summer. The first one is a review of Pre-Calculus. The second part is a set of problems similar to those found on the IB External Assessment. They cover topics you have already learned in Geometry, Algebra 2, and Precalculus.

This assignment is due the first day of class. There will be a test on this assignment on the second day of class.

I will be available over the summer via email at amurray@rbrhs.org if you have any questions. I will also be holding help sessions August 24 and August 25 from 2-4 pm and August 29-31 1-3 pm, in Room 210.

Please note that it is recommended that you purchase a TI-84+ graphing calculator, since we will be using it in class during the year, you will need it to complete the summer assignment, and it is necessary for the IB exam. Please see Ms. S. Zielinski, Math Department Supervisor, if you need to borrow one from the school due to financial circumstances, or if you own a different model that is not allowed on the IB External Assessment.

Please send me an email acknowledging your receipt of this packet as soon as possible so that I can easily construct an email list and keep you posted as to any changes in the summer help schedule.

Enjoy your summer and I look forward to having you in class next year!

Sincerely,

Ms. A. Murray
Teacher of Mathematics
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Little Silver, NJ 07739

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SHOW EVIDENCE OF YOUR UNDERSTANDING for each problem in this packet. This packet will be turned in on the first day of school and then graded. Every problem in this packet is to be completed **WITHOUT A CALCULATOR** unless indicated with this symbol:



Part 1. PreCalculus Review

The section numbers refer to the *Calculus Book* by Finney, Demana, Waits, and Kennedy.

Section 1.1

37. Find the value of y for which the line through A and B

37. _____

has the given slope m : $A(-2, 3)$, $B(4, y)$, $m = -2/3$

41. For what value of k are the two lines $2x + ky = 3$ and $x + y = 1$

41a) _____

(a) parallel? (b) perpendicular?

41b) _____

57. Consider the circle of radius 5 centered at $(0, 0)$. Find an equation of the line tangent to the circle at the point $(3, 4)$ in slope intercept form.

57. _____

Section 1.2

1. Write a formula that expresses the first variable as a function of the second:
the area A of a circle as a function of its diameter, d

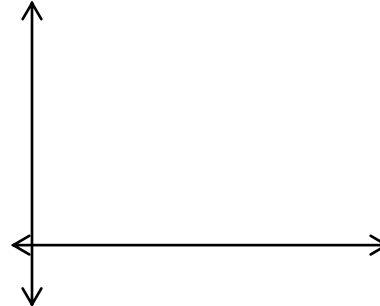
1. _____

7. Consider the function $y = 2 + \sqrt{x-1}$.

(a) State the domain: _____

(b) State the range: _____

(c) Draw its graph.



27. Algebraically determine whether the function is even, odd, or

27. _____

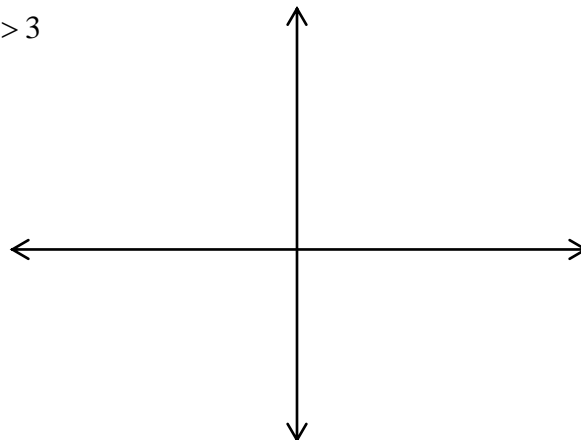
neither by stating and using their respective definitions: $y = \frac{x^3}{x^2 - 1}$

In Exercise 33, (a) draw the graph of the function labeling key points.
Then find its (b) domain and (c) range.

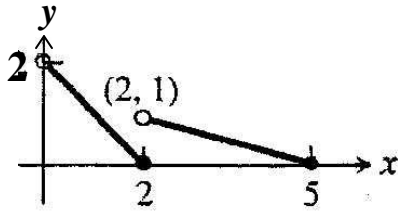
33b)D: _____

$$33. f(x) = \begin{cases} 4 - x^2, & x < 1 \\ (3/2)x + 3/2, & 1 \leq x \leq 3 \\ x + 3, & x > 3 \end{cases}$$

33c)R: _____



43. Write a piecewise formula for the function below.



49. If $f(x) = x + 5$, $g(x) = x^2 - 3$ find each of the following and circle your answers.

(a) $f(g(x))$

(b) $g(f(x))$

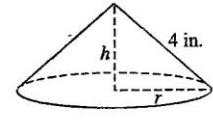
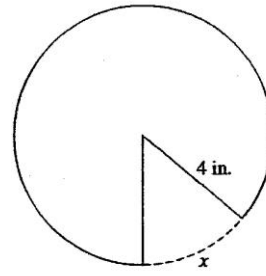
(c) $f(g(0))$

(d) $g(f(0))$

(e) $g(g(-2))$

(f) $f(f(x))$

55. Begin with a circular piece of paper with a 4-in. radius as shown in (a). Cut out a sector with an arc length of x . Join the two edges of the remaining portion to form a cone with radius r and height h , as shown in (b).



a) Explain why the circumference of the base of the cone is $8\pi - x$.

b) Express the radius r as a function of x .

c) Express the height h as a function of x .

d) Express the volume V of the cone as a function of x .

Section 1.3

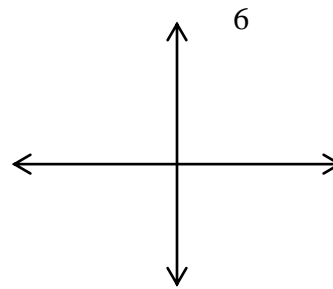
2. Graph the function $y = 3e^{-x} - 2$ and indicate asymptote(s).

State its domain, range, and intercepts.

Domain: _____

Range: _____

Intercepts: _____



7. Rewrite the exponential expression to have the indicated base:

$$\left(\frac{1}{8}\right)^{2x}, \text{ base } 2$$

7. _____

23. The half-life of phosphorus-32 is about 14 days. There are 6.6 grams present initially.

a. Express the amount of phosphorus-32 remaining as a function of time t.

23a. _____

b. When will there be 1 gram remaining? Solve algebraically.

23b. _____



28. Determine how much time is required for an investment to triple in value if interest is earned at the rate of 5.75% compounded daily?

28. _____

Solve algebraically.



Section 1.4

Parametric equations are given below. (#13, 19)

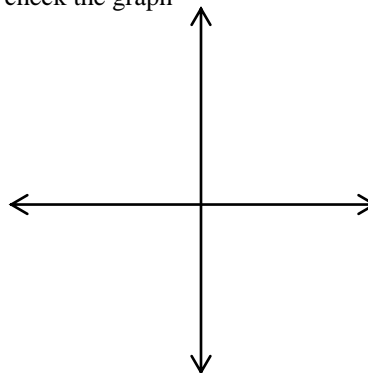
Complete the table and sketch the curve represented by the parametric equations (label the initial and terminal points as well as indicate the direction of the curve). Then eliminate the parameter and write the corresponding rectangular equation whose graph represents the curve. Be sure to define the portion of the graph of the rectangular equation traced by the parametric equations.

13. $x = 4\sin t, \quad y = 2\cos t, \quad 0 \leq t \leq 2\pi$

t	0	$\pi/4$	$\pi/2$	$3\pi/4$	π	$3\pi/2$	2π
x							
y							



check the graph

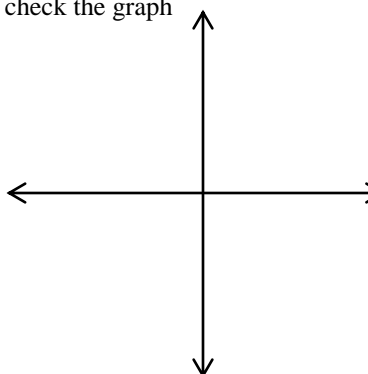


15. $x = 2t - 5, \quad y = 4t - 7, \quad -2 \leq t \leq 3$

t	-2	-1	0	1	2	3
x						
y						



check the graph



Section 1.5

7. Algebraically find the inverse of $y = \frac{3}{x-2} - 1$

7. _____

15. If $f(x) = x^3 - 1$, find f^{-1} and verify that $f(f^{-1}(x)) = f^{-1}(f(x)) = x$

In exercises 39 & 41, draw the graph and determine the domain and range of the function.

39. $y = 2 \ln(3-x) - 4$

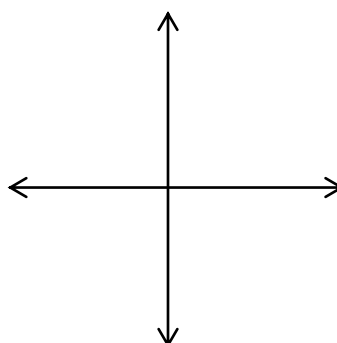
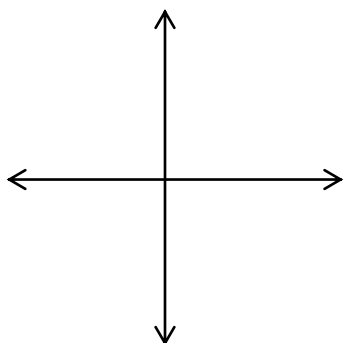
D: _____

R: _____

41. $y = \log_2(x+1)$

D: _____

R: _____



In exercises 33 & 35, solve the equation algebraically. Support your solution graphically.

33. $(1.045)^t = 2$



35. $e^x + e^{-x} = 3$

In exercises 37-38, solve for y algebraically.

37. $\ln y = 2t + 4$

38. $\ln(y-1) - \ln 2 = x + \ln x$

Section 1.6

27. Give the measure of the angle in radians and degrees: $\sin^{-1}(0.5)$

rad: _____

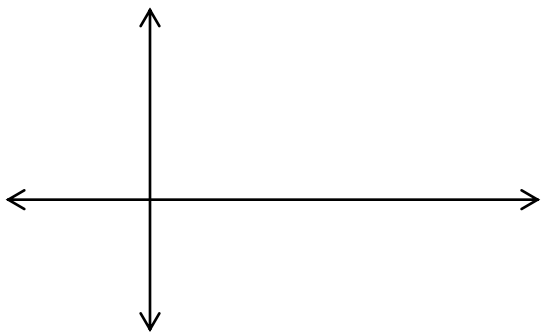
deg: _____

21. Without a calculator, sketch one cycle of the curve $y = -4 \sin \frac{\pi}{3} x$

Amp: _____

and identify and amplitude and period and label your axes.

Period: _____



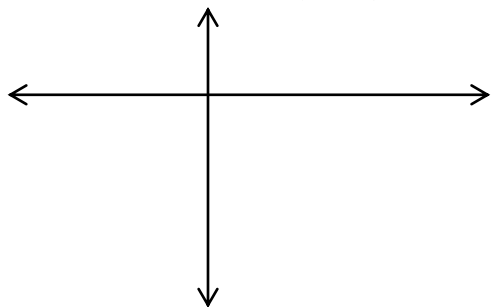
13. Determine (a) the period, (b) the domain, and (c) the range, and (d) sketch one

a) Period: _____

cycle of the function: $y = -3 \tan(x + \pi) + 2$

b) D: _____

c) R: _____



Algebraically, solve each equation in the specified interval (leave answers in radians or π radians where applicable).

(#31, 33, 35)

31. $\tan x = 2.5$, $0 \leq x < 2\pi$



31. _____

33. $\csc x = 2$, $0 < x < 2\pi$

33. _____

35. $\cos x = -0.5$, $-\infty < x < \infty$

35. _____

41. Evaluate the expression in exact form: $\sin\left(\cos^{-1}\left(\frac{7}{11}\right)\right)$

41. _____

Part 2. External Assessment Practice.

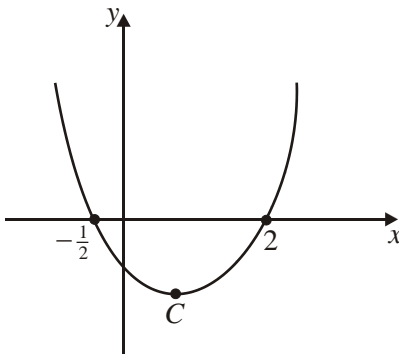


May be used but is not necessary.

The following problems are based on old IB External Assessments. They cover topics you have already learned in Geometry, Algebra 2 and Precalculus. Solve each problem, showing all work. If you use a graphing calculator, make sure to show the set up and intermediate steps.

1. The diagram represents the graph of the function

$$f: x \mapsto (x - p)(x - q).$$



- (a) Write down the values of p and q .

- (b) The function has a minimum value at the point C . Find the x -coordinate of C .

<p><i>Working:</i></p>	<p><i>Answers:</i></p> <p>(a)</p> <p>(b)</p>
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(Total 4 marks)

2. A triangle has sides of length 4, 5, 7 units. Find, to the nearest tenth of a degree, the size of the largest angle.

Working:

Answer:

.....

(Total 4 marks)

3. If $A = \begin{pmatrix} 2p & 3 \\ -4p & p \end{pmatrix}$ and $\det A = 14$, find the possible values of p .

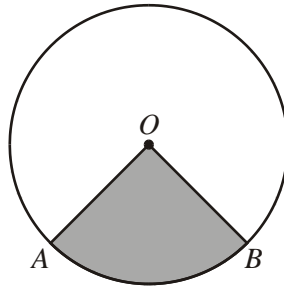
Working:

Answer:

.....

(Total 4 marks)

4. O is the centre of the circle which has a radius of 5.4 cm.



The area of the shaded sector OAB is 21.6 cm^2 . Find the length of the minor arc AB .

Working:

Answer:

.....

(Total 4 marks)

5. Solve the equation $9^{x-1} = \left(\frac{1}{3}\right)^{2x}$.

Working:

Answer:

.....

(Total 4 marks)

6. Two functions f and g are defined as follows:

$$f(x) = \cos x, \quad 0 \leq x \leq 2\pi;$$

$$g(x) = 2x + 1, \quad x \in \mathbb{R}.$$

Solve the equation $(g \circ f)(x) = 0$.

Working:

Answer:

.....

(Total 4 marks)

7. The function f is given by

$$f(x) = \frac{2x+1}{x-3}, x \in \mathbb{R}, x \neq 3.$$

- (a) (i) Show that $y = 2$ is an asymptote of the graph of $y = f(x)$. (2)
- (ii) Find the vertical asymptote of the graph. (1)
- (iii) Write down the coordinates of the point P at which the asymptotes intersect. (1)
- (b) Find the points of intersection of the graph and the axes. (4)
- (c) Hence sketch the graph of $y = f(x)$, showing the asymptotes by dotted lines. (4)
- (d) Show that $f'(x) = \frac{-7}{(x-3)^2}$ and hence find the equation of the tangent at the point S where $x = 4$. (6)
- (e) The tangent at the point T on the graph is parallel to the tangent at S .
Find the coordinates of T . (5)
- (f) Show that P is the midpoint of $[ST]$. (1)

(Total 24 marks)

8. Let $M = \begin{pmatrix} a & 2 \\ 2 & -1 \end{pmatrix}$, where $a \in \mathbb{Z}$.

(a) Find M^2 in terms of a .

(4)

(b) If M^2 is equal to $\begin{pmatrix} 5 & -4 \\ -4 & 5 \end{pmatrix}$, find the value of a .

(2)

(c) Using this value of a , find M^{-1} and **hence** solve the system of equations:

$$\begin{aligned} -x + 2y &= -3 \\ 2x - y &= 3 \end{aligned}$$

(6)

(Total 12 marks)