

Mathematics 12 Pre-Calculus WNCP

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Textbook

This course uses the textbook “Pre-Calculus 12” ISBN 9780070738720 by McGraw-Hill Ryerson at 1-800-565-5758. Costs about \$ 95.

Curriculum Outline

Unit 1 Function Transformations

Unit 3 Polynomial Functions

Unit 5 Trigonometry Functions & Graphs

Unit 7 Exponential Functions

Unit 9 Rational Functions

Unit 11 Permutations, Combinations & the Binomial Theorem

Unit 2 Radical Functions

Unit 4 Trigonometry & the Unit Circle

Unit 6 Trigonometric Identities

Unit 8 Logarithmic Functions

Unit 10 Function Operations

Structure

This course is generally designed with the self-paced student in mind. It is based on a mastery system in which the student must obtain an 80% on the tests. Each chapter has two versions in which the student has a chance to reach and or exceed the 80% mastery level.

Evaluation

There are 11 chapter tests which account for 30% of the final mark. There are 4 cumulative tests which account for 70% of the final mark.

Composition

This course is made up of:

11 Chapters Outlines,

11 Chapter Tests each with an A and a B version (22 tests), Plus (22 tests) Answer Keys

4 Cumulative Tests, Plus (4 Cumulative Tests) Answer Keys,

All Answer Keys have a suggested marking scheme,

All files are put on disk in pdf and MS Word,

A perpetual license for your school.

The entire paper course is placed in a binder along with the disk and shipped as one unit.

Cost: \$ 495.00. See Ordering.

Mathematics 12 Pre-Calculus**Record Chart****Name:****Commencement Date:**

Chapter	Topic	Test A	Test B	Average	Date
1	Function Transformations				
2	Radical Functions				
3	Polynomial Functions				
Unit 1 Transformations & Functions Cumulative Test					
4	Trigonometry & the Unit Circle				
5	Trigonometry Functions & Graphs				
6	Trigonometric Identities				
Unit 2 Trigonometry Cumulative Test					
7	Exponential Functions				
8	Logarithmic Functions				
Unit 3 Exponential & Logarithmic Functions Cumulative Test					
9	Rational Functions				
10	Function Operations				
11	Permutations, Combinations & the Binomial Theorem				
Unit 4 Equations & Functions Cumulative Test					

Course Evaluation	Total Marks	Percent	Value	Result
Tests (11)			30%	
Cumulative Tests (4)			70%	

Unit 1: Transformations and Functions

Textbook: [Pre-Calculus 12](#) by McGraw-Hill Ryerson

Chapter 1: Function Transformations

Learning Outcomes:

- Graphing & identifying functions
- Graphing & identifying horizontal and vertical translations & stretches
- Graphing & identifying reflections and inverse functions
- Graphing & identifying combined transformations of functions
- Algebraically determining the equation of the inverse of a function

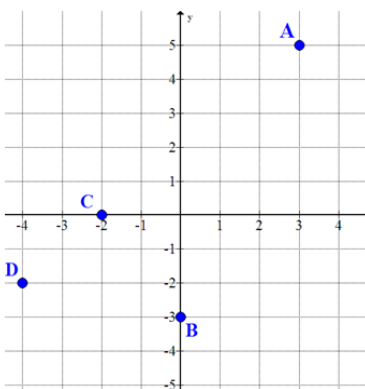
Graphing Review

View these YouTube videos:

<http://tinyurl.com/pc12basic-graphs>

<http://tinyurl.com/pc12domain-range>

We graph ordered pairs on a coordinate system. The first coordinate is the x -coordinate, and indicates how far to move left or right from the origin, $(0, 0)$. The second coordinate is the y -coordinate, and tells how far to move up or down.

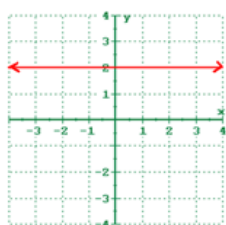


The coordinates of the points on the grid:

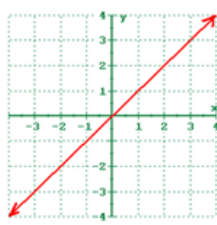
- A = $(3, 5)$
- B = $(0, -3)$
- C = $(-2, 0)$
- D = $(-4, -2)$

Given an equation relating the variables x and y , we can sketch its graph by making a table of values by hand or by using a graphing calculator. Either way, we usually isolate “ y ” first.

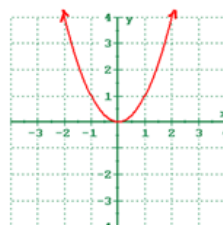
Common Functions:

Constant Function

$$y = C$$

Linear Function

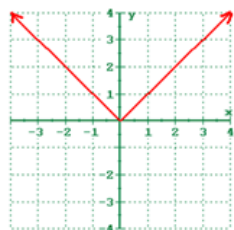
$$y = mx + b$$

Quadratic Function

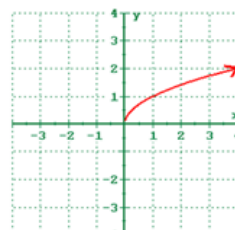
$$y = Ax^2 + Bx + C$$

Cubic Function

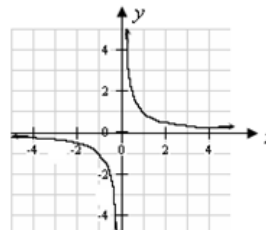
$$y = x^3$$

Absolute Value Function

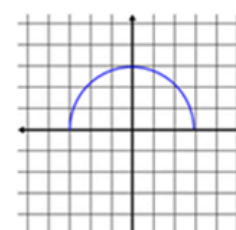
$$y = |x|$$

Square Root Function

$$y = \sqrt{x}$$

Reciprocal Function

$$y = \frac{1}{x}$$

Semi-circle Function

$$y = \sqrt{C - x^2}$$

Domain is the set of all x values that are valid for a function.

Range is the set of all y values that are valid for a function.

Example: consider the quadratic function $y = x^2$ which is graphed above. The domain is: x is all real numbers and the range is: y is greater than and equal to zero. This is written as:

$$\text{Domain} : \{x \mid x \in R\}$$

$$\text{Range} : \{y \mid y \geq 0, y \in R\}$$

Section 1.1: Horizontal and Vertical Translations

Study the notes and examples on pages 8-11 and memorize the **Key Ideas** on page 12.

View these YouTube videos for lessons on this section:

<http://tinyurl.com/PC12Sec1-1>

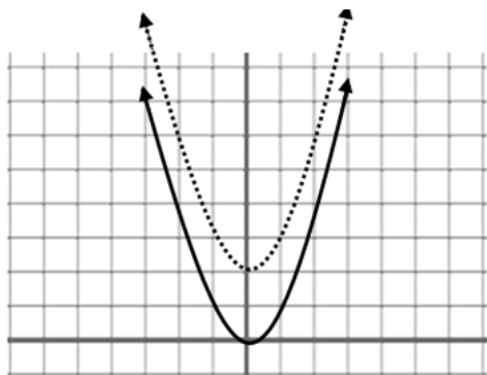
<http://tinyurl.com/PC12Sec1-1-B>

Vertical translations transform the graph of $y = f(x)$ to $y - k = f(x)$ or $y = f(x) + k$ and result in the graph and its points moving up or down by k units.

- **When y is replaced with $y - k$ translate k units up** - $(x, y) \rightarrow (x, y + k)$.
- **When y is replaced with $y + k$ translate k units down** - $(x, y) \rightarrow (x, y - k)$.

Example: if $y = x^2$ is compared to $y - 2 = x^2$, the parabola is translated 2 units up. Note: you can also rewrite this as $y = x^2 + 2$. Each y -coordinate on the graph is moved 2 units up by adding 2. This means the point $(0,0)$ on $y = x^2$ is now the image point $(0,2)$ on $y - 2 = x^2$. Using mapping notation, we write these points in general as

$$(x, y) \rightarrow (x, y + 2)$$



$$\text{Domain: } \{x \mid x \in R\} \rightarrow \{x \mid x \in R\}$$

$$\text{Range: } \{y \mid y \geq 0, y \in R\} \rightarrow \{y \mid y \geq 2, y \in R\}$$

Unit 2: Trigonometry

Textbook: [Pre-Calculus 12](#) by [McGraw-Hill Ryerson](#)

Chapter 4: Trigonometry and the Unit Circle

Learning Outcomes:

- Converting from degree to radian measure
- Graphing angles in standard position
- Using trigonometric ratios with exact triangles
- Solving equations

Section 4.1: Angles and Angle Measure

Study the notes and examples on pages 166-174 and memorize the **Key Ideas** on page 175.

View these YouTube videos for lessons on this section:

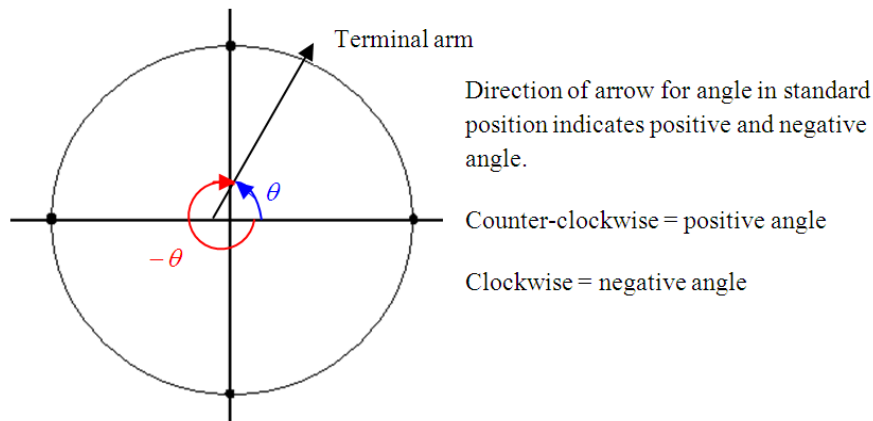
<http://tinyurl.com/pc12sec4-1>

<http://tinyurl.com/PC12sec4-1-B-part1>

<http://tinyurl.com/PC12sec4-1-B-part2>

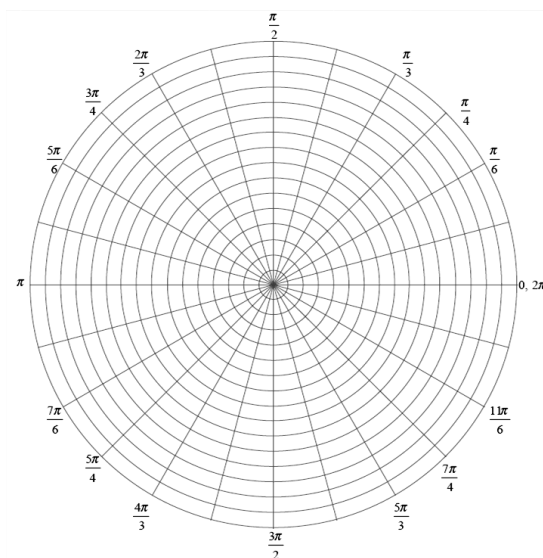
To convert from radians to degrees multiply with $\frac{180^\circ}{\pi}$

To convert from degrees to radians multiply with $\frac{\pi}{180^\circ}$



Practice dividing up the circle into radians and degrees. Use the denominator of the fraction to divide the semi-circle up. For example if you had to graph $\frac{5\pi}{7}$, you would divide each semi-circle into 7 even slices and count 5 to draw your terminal arm

at $\frac{5\pi}{7}$.



To find coterminal angles:

For radians add or subtract $2\pi n$, $n \in N$ (n is any natural number)

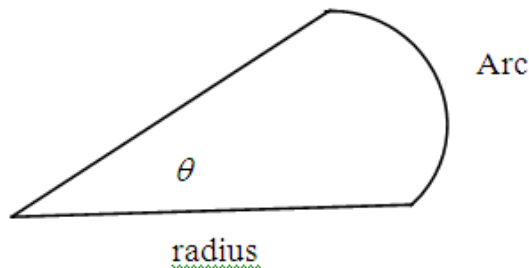
For degrees add or subtract $360^\circ n$, $n \in N$ (n is any natural number)

In general, you can find any coterminal angle: $\theta \pm 2\pi n, n \in N$ or $\theta \pm 360^\circ n, n \in N$ (n is any natural number)

The arc length of the circle is proportionate to the radius and the angle formed; therefore there is a formula to determine arc length.

$$a = r\theta \text{ where } \theta \text{ is in radians}$$

(if given degrees or determining degrees, use the conversion to radians)



Complete the following questions and check your answers with the solutions at the back of the text.

Section	Page	Practice Questions	Check When Done
4.1	175-176	1ac, 2ace, 3ace, 4ace, 5ace, 6abc, 7abc, 8ac, 9ab, 11ace, 12ac, 13ac, 14	<input type="checkbox"/>

Section 11.2: Combinations

Study the notes and examples on pages 537-541 and memorize the **Key Ideas** on page 541.

View these YouTube videos for lessons on this section:

<http://tinyurl.com/pc12sec11-2>

Combinations are different than permutations in that in combinations, when calculating the total number of arrangements of objects, the order of the arrangements does not matter.

- **Permutations: the order of the objects in the arrangements matters and is counted as a different arrangement**
- **Combinations: the order of the objects in the arrangements does not matter and is not counted as a different arrangement.**

The notation of combinations is ${}_n C_r$ or $\binom{n}{r}$. In the calculator press MATH → left

arrow for PRB menu → option 3: ${}_n C_r$. A formula can also be used to represent

combinations. This formula can be used when solving for n or r algebraically. The

formula or calculation for combinations is: ${}_n C_r = \frac{n!}{r! (n-r)!}$

Example: How many different ways can you form a project group of exactly 3 boys and 3 girls if there are 8 boys and 7 girls in the class of 15 people?

Solution: *First you need to think about the cases separately, then multiply them together to get the total.*

For the boys: $n = 8$ and $r = 3$ (from 8 boys you choose 3) ${}_8 C_3$

For the girls: $n = 7$ and $r = 3$ (from the 7 girls you choose 3) ${}_7 C_3$

${}_8 C_3 \times {}_7 C_3 = 56 \times 35 = 1960$ ways of forming this group.

Example: How many ways are there of having a 5 card hand consist of exactly 3 spades and 2 hearts?

Solution: *This is a combination since the order of the cards in the hand does not matter. A person can rearrange the cards in their hand in any order they choose, however, all of the cards in the hand will remain the same.*

For the spades: $n = 13$ and $r = 3$ (from 13 spades choose 3)

For the hearts: $n = 13$ and $r = 2$ (from 13 hearts choose 2)

${}_{13} C_3 \times {}_{13} C_2 = 286 \times 78 = 22308$ different 5 card hands

consisting of 3 spades and 2 hearts.

Complete the following questions and check your answers with the solutions at the back of the text.

Section	Page	Practice Questions	Check When Done
11.2	534-536	1, 3ac, 4, 5, 6ac, 10, 11, 13, 15, 17, 18, 19	<input type="checkbox"/>

Pre-Calculus 12: Chapter 1 - Function Transformations Test A

Name: _____ Date: _____

30

Marks

- (2) 1. Describe the transformations in the following equations:

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

b) $y = \frac{1}{x+2} - 1$

- (2) 2. If the point (2, -1) is on the graph of
- $y = f(x)$
- , what is the point on the graph of
- $y = f(x-2) - 3$
- ?

- (1) 3. Write the function
- $y = \sqrt{x}$
- , with the following translations:

2 units right and 5 units up

- (1) 4. If the point (m, n) is on the graph of
- $y = f(x)$
- , which of the following is the point on the graph of
- $y = f(x+1) - 3$
- ?

a) (m+1, n+3)

b) (m+1, n-3)

c) (m-1, n-3)

d) (m-1, n+3)

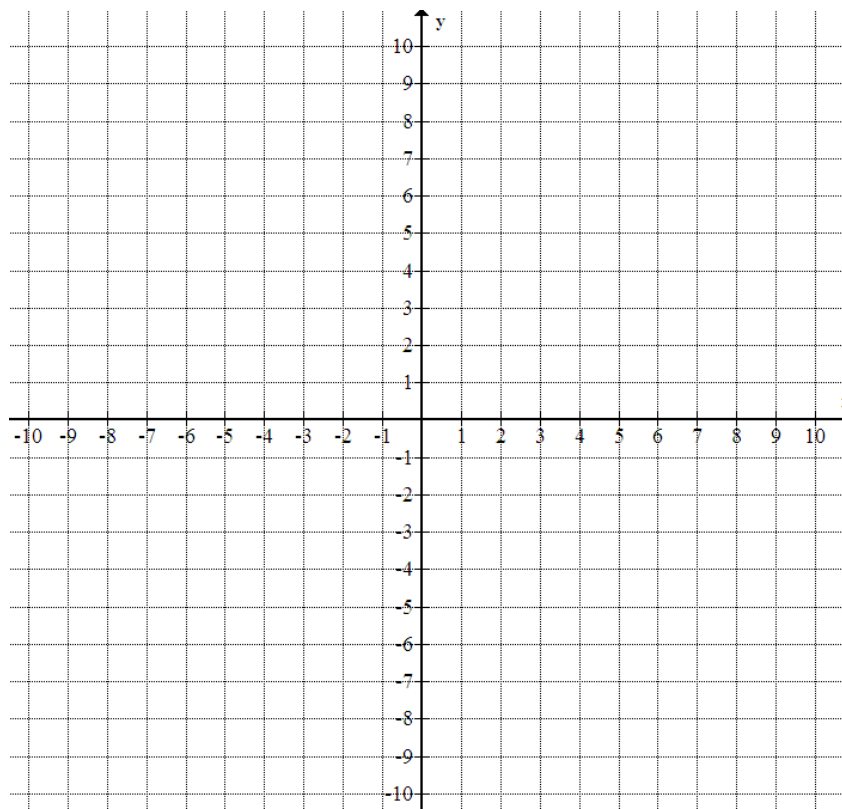
Pre-Calculus 12: Chapter 2 – Radical Functions Test A

Name: _____ Date: _____

32

Marks

- (5) 1. Graph the function $y = \sqrt{x}$ and the transformed graph $y = -2\sqrt{x-3} - 1$ on the grid provided. State the domain and range of each.



Property	$y = \sqrt{x}$	$y = -2\sqrt{x-3} - 1$
Domain		
Range		

Pre-Calculus 12: Chapter 3 – Polynomial Functions Test A

Name: _____ Date: _____

56

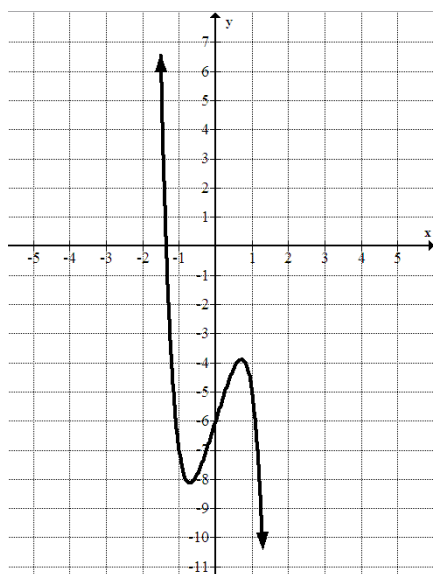
Marks

- (7) 1. Complete the chart of characteristics of polynomial functions

Characteristic	$y = 2x^5 - 5x^3 + x$	$y = -x^3 + 2x^4 - 4x^2$
Leading coefficient (+ or -)		
Degree (odd/even)		
End Behaviour		
Number of x-intercept(s)		
Value of y-intercept		
Domain		
Range		

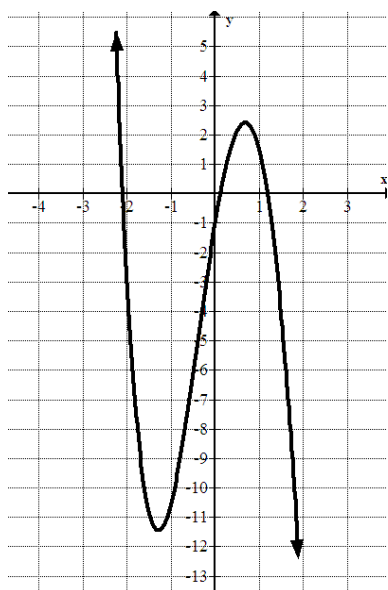
(5) 2. For each of the following graphs complete the table.

a)



Characteristic	
Leading coefficient (+ or -)	
Degree (odd/even)	
Number of x -intercept(s)	
Domain	
Range	

b)



Characteristic	
Leading coefficient (+ or -)	
Degree (odd/even)	
Number of x -intercept(s)	
Domain	
Range	

(6) 3. Divide the following polynomials by the binomial given. Use long division OR synthetic

division. Write your final answer in the form $\frac{P(x)}{x-a} = Q(x) + \frac{R}{x-a}$

a) $x^3 + 2x^2 - 7x - 2 \div x - 2$