

## MCF 3M – Practice Exam

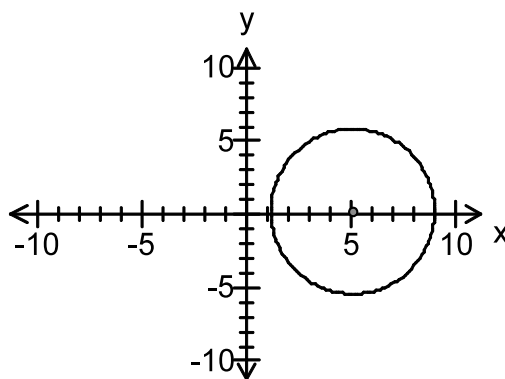
This is a practice exam. It does not cover all the material in this course and should not be the only review that you do in preparation for your final exam. Your exam may contain questions that do not appear on this practice exam. Ideally, this practice exam should be done after you have completed the final exam review.

### Part A - Multiple Choice.

Write the correct letter in the answer section on page 1.

(1 mark for each answer)

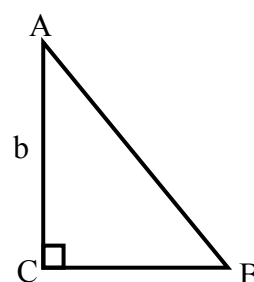
- A1. A function is:
- An equation that creates two sets of numbers.
  - A rule for mapping one set of numbers to another (i.e.  $x \rightarrow y$ ).
  - A set of variables.
  - A graph that has no restrictions on the domain and range.
- A2. A graph shows the height of a ball falling from 250 m versus the time until it reaches the ground. The domain can be stated as:
- $t \in \mathbb{R}$
  - $t \geq 0$
  - $t < 0$
  - $t \leq 250$
- A3. To determine if a graph is a function, you can use:
- the vertical line test
  - the horizontal line test
  - the slope / intercept test
  - the function test
- A4. The graph shown on the right represents a function.
- True
  - False
- A5. The solutions to equation  $x^2 - 7x + 10 = 0$  are
- $x = 10$  and  $x = 1$
  - $x = -5$  and  $x = -2$
  - $x = 5$  and  $x = 2$
  - $x = -5$  and  $x = 2$
- A6. For the quadratic function  $y = 5(x - 4)^2 - 6$ , the coordinates of the vertex are:
- (5, 6)
  - (4, 6)
  - (-4, -6)
  - (4, -6)
- A7. For the quadratic function  $y = (x - 4)(x - 8)$ , the **coordinates of the vertex** are:
- (4, 8)
  - (6, 0)
  - (6, 22)
  - (6, -4)
- A8. A stone is thrown upwards from a bridge. Its fall can be modelled by the formula  $h = -5t^2 + 30t + 35$ , where  $t$  is the time measured in seconds and  $h$  is the height measured in metres. The height of the bridge is:
- 5 m
  - 30 m
  - 35 m
  - 60 m



- A9. An exponential function can be modelled by the function  $y = 4(2)^x$ . The y intercept of this function is:
- $(0, 4)$
  - $(0, 2)$
  - $(4, 0)$
  - $(2, 0)$
- A10. An exponential function can be modelled by the function  $y = 4(2)^x$ . The common ratio of this is function is:
- 4
  - 2
  - 8
  - 2
- A11. An exponential function can be modelled by the function  $y = 4(2)^x$ . This function can be described as:
- decreasing slowly
  - decreasing quickly
  - increasing slowly
  - increasing quickly
- A12. An exponential function can be modelled by the function  $y = 4(2)^x$ . The range of this function is:
- $y = 0$
  - $y > 0$
  - $y < 0$
  - $y \geq 0$
- A13. An investment of \$1000 is earning interest at the rate of 4% /a compounded quarterly. The number of compounding periods (n) for 5 years is:
- $n = 5$
  - $n = 10$
  - $n = 15$
  - $n = 20$
- A14. An investment of \$1000 is earning interest at the rate of 4% /a compounded quarterly. The actual rate of interest paid in each payment period (i) is
- 4%
  - 2%
  - 3%
  - 1%
- A15. The formula for compound interest is given by
- $I = Prt$
  - $FV = PV^n$
  - $FV = PV(1+i)^n$
  - $PV = FV(1+i)^n$

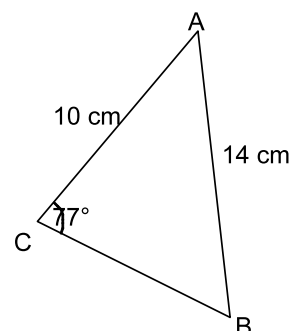
A16. To solve for missing side ( b ) in the triangle, you use the formula

- a.  $c^2 = a^2 + b^2$
- b.  $b^2 = c^2 + a^2$
- c.  $c = \frac{\tan 90^\circ}{b}$
- d.  $b = 180^\circ - A - B$



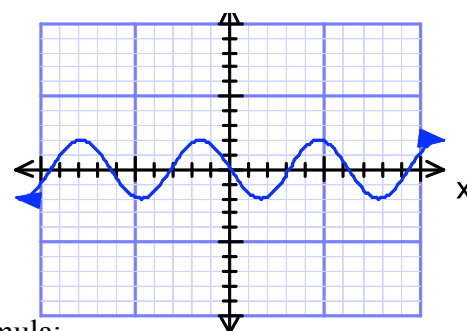
A17. Which formula would you use to solve for angle B in the given triangle?

- a.  $b^2 = a^2 + c^2 - 2ac \cos B$
- b.  $\cos 77^\circ = \frac{a}{10}$
- c.  $a^2 = b^2 + c^2$
- d.  $\frac{\sin B}{b} = \frac{\sin C}{c}$



A18. For the function shown in the graph, it can be described as:

- a. quadratic
- b. exponential
- c. periodic
- d. linear



A19. The amplitude for a sinusoidal curve can be calculated by the formula:

- a.  $\frac{\max + \min}{2}$
- b.  $\frac{\max - \min}{2}$
- c.  $\frac{y_2 - y_1}{x_2 - x_1}$
- d.  $\frac{x_2 + x_1}{2}$

A20. Identify the amplitude and equation of the centre line of  $f(x) = 2 \sin(x) + 5$

- a. amplitude: 2; equation of centre line:  $y = 5$
- b. amplitude: 5; equation of centre line:  $y = 2$
- c. amplitude: 2; equation of centre line:  $y = -5$
- d. amplitude: 5; equation of centre line:  $y = -2$

**Part B - Short Answer / Extended Response. Provide full solutions and show all necessary work. [80 marks]**

B1. Create a mapping diagram (or a set of ordered pairs) that shows an example of a function.

[2 marks]

B2. For the function  $f(x) = 2x^2 - x + 5$

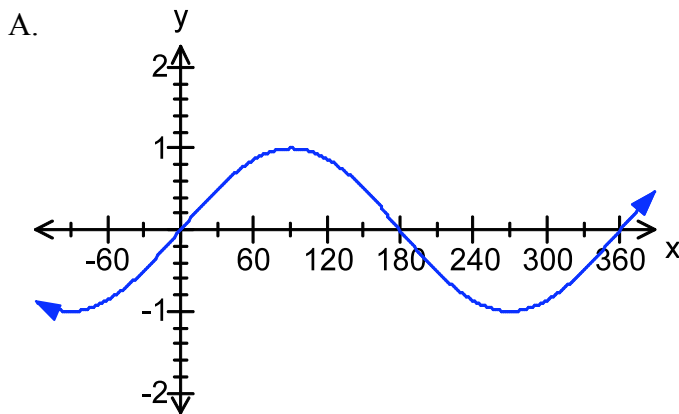
[2 marks]

A. Calculate  $f(-1)$ .

B. Calculate  $f(2)$ .

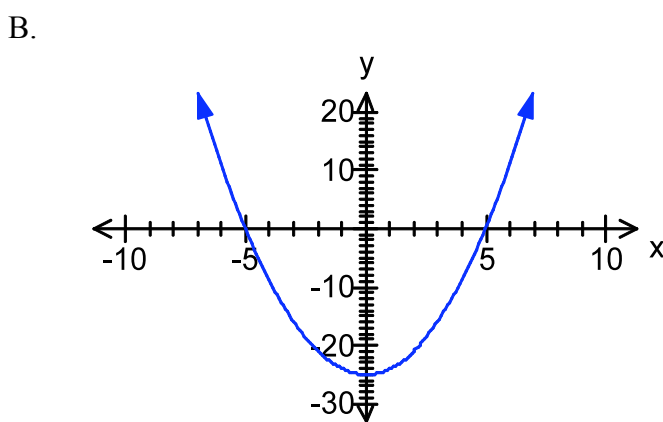
B3. For the following graphs, state the domain and range.

[4 marks]



Domain: \_\_\_\_\_

Range: \_\_\_\_\_



Domain: \_\_\_\_\_

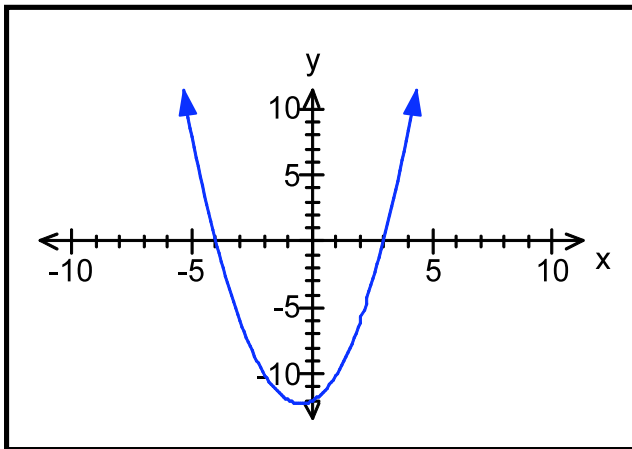
Range: \_\_\_\_\_

Recall: Greater than or equal to:  $\geq$   
Less than or equal to:  $\leq$

If  $y$  is between two values:  
 $minimum \leq y \leq maximum$

B4. Using the graph below, complete the chart.

[3 marks]



X intercepts or zeros	Equations and roots of equations	Algebraic Model of Quadratic function.
	<b>Equation:</b> $(x \quad)(x \quad) = 0$ <b>Roots:</b> $x = \underline{\quad}$ and $x = \underline{\quad}$	$y = ( \quad )( \quad )$

B5. Factor each expression.

[4 marks]

A.  $x^2 + 10x + 24$

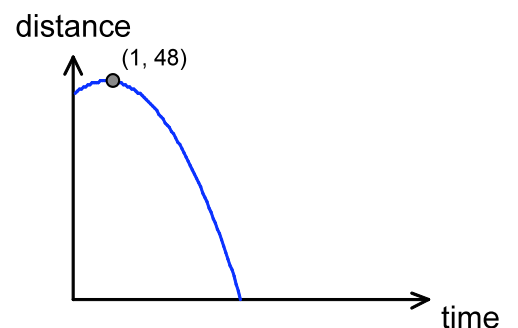
B.  $2x^2 - 5x - 12$

B6. A diver is on the diving platform at Wonder Mountain in Canada's Wonderland. She jumps up and dives into the water at the base of the mountain. Her jump is modelled by the graph.

A. Which function would represent the graph?  
[1 mark]

1)  $d = -3t^2 + 6t + 45$

2)  $d = 0.08t^2 + 16$



B. What is the height of the platform from where the diver jumps? [1 mark]

C. At what time will the diver enter the water?  
(Hint: solve the equation when  $d = 0$ )

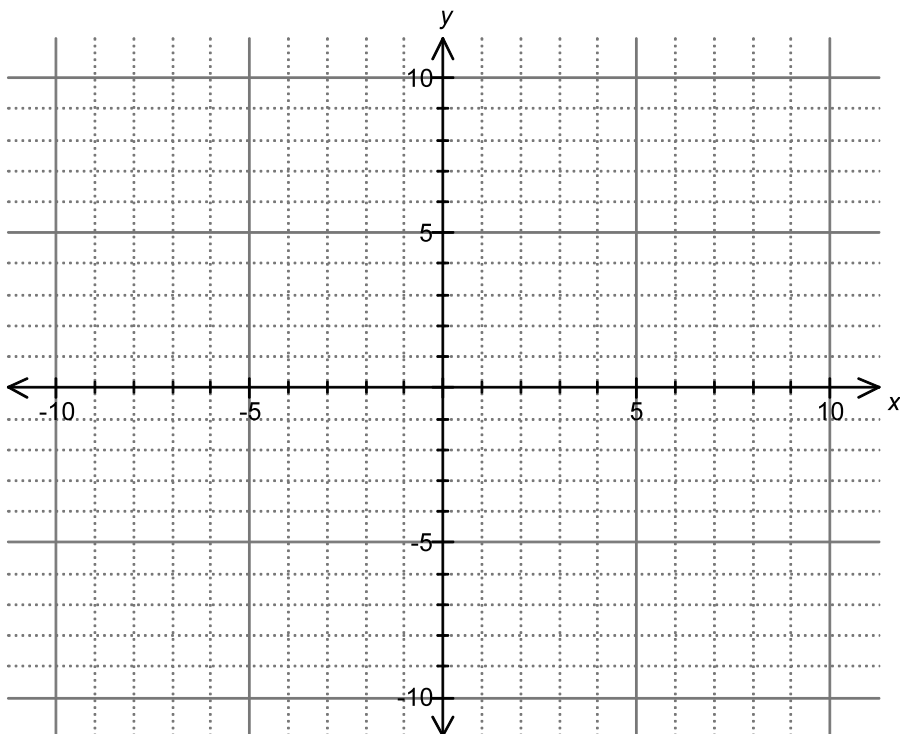
[4 marks]

B7. For the quadratic function  $y = 2x^2 - 8x + 7$  :

A. Rewrite the function in the form  $y = a(x - h)^2 + k$  [3 marks]

B. What are the coordinates of the vertex? [1 mark]

C. Use the coordinates of the vertex and the step pattern to sketch and label function on the graph. Identify the vertex and 2 other points on the graph. [5 marks]



B8. The population of a town is modeled by the function  $P(t) = 6t^2 + 110t + 4000$  , where P(t) is the population and t is the time in years since 2000.

A. What will the population be in 2020? [2 marks]

B. When will the population be 6000? [5 marks]

(Hint: Rearrange  $6t^2 + 110t + 4000 = 6000$ , then use  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ )

B9. A quadratic function is written in the form  $y = a(x - 5)(x + 2)$ . The point  $(-3, 24)$  is on the curve of the quadratic. Use the point to help you find the value of “a”. [3 marks]

B10. For the function  $y = 5(0.7)^x$ , identify:

- a) the coordinates of the y – intercept. \_\_\_\_\_ [1 mark]
- b) the common ratio. \_\_\_\_\_ [1 mark]
- c) if the function shows growth or decay \_\_\_\_\_ [1 mark]
- d) the domain of the function. \_\_\_\_\_ [1 mark]
- e) the range of the function. \_\_\_\_\_ [1 mark]

B11. A sample of bacteria in a laboratory is observed to have the following growth pattern.

A. Calculate the first differences. [1 mark]

B. What do the first differences indicate? [1 mark]

C. Calculate the ratio. [1 mark]

D. What is the domain for this function? [1 mark]

E. What is the range for this function? [1 mark]

Time (in hours)	Number of Bacteria	First Differences	Ratio
0	100		
1	200		
2	400		
3	800		
4	1600		
5	3200		
6	6400		

F. Write an algebraic model for this growth in the form  $y = a(b)^x$  [2 marks]

G. Use the model to predict how many bacteria would exist in hour 10. [2 marks]

The following formulae are needed for the next section.

Simple Interest:  $I = P \times r \times t$

Compound Interest:  $FV = PV(1 + i)^n$

B12. Calculate the simple interest in each situation. [2 marks]  
a. \$1000 invested at 5.5% /a for 2 years.

b. \$3500 borrowed at 7% /a for 38 months. [2 marks]

B13. An investment of \$3500 is earning interest at 4% /a, compounded quarterly. If the investment is made for 5 years, calculate the amount of the investment? [3 marks]

B14. With the help of the TVM solver, solve the following problem.  
For ten years, \$500 is deposited at the end of every month in a savings account that pays 5% /a, compounded monthly. Find the future value of the annuity. [2 marks]

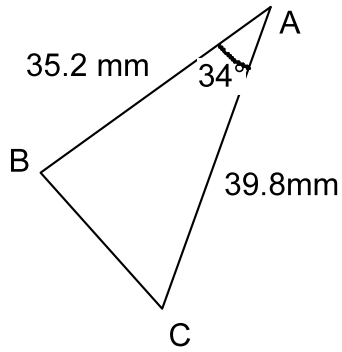
N =
I =
PV =
PMT =
FV =
P/Y =
C/Y =

B15. How much total interest was earned by the annuity in B14? [2 marks]



B16. Find the length of the missing side.

[3 marks]



B17. The longest side of a triangle is 50 cm. The measures of two angles in the triangle are  $42^\circ$  and  $64^\circ$ . **Find the lengths of the other two sides**, to the nearest centimetre.  
(Hint: draw the triangle and remember the longest side is opposite the largest angle)

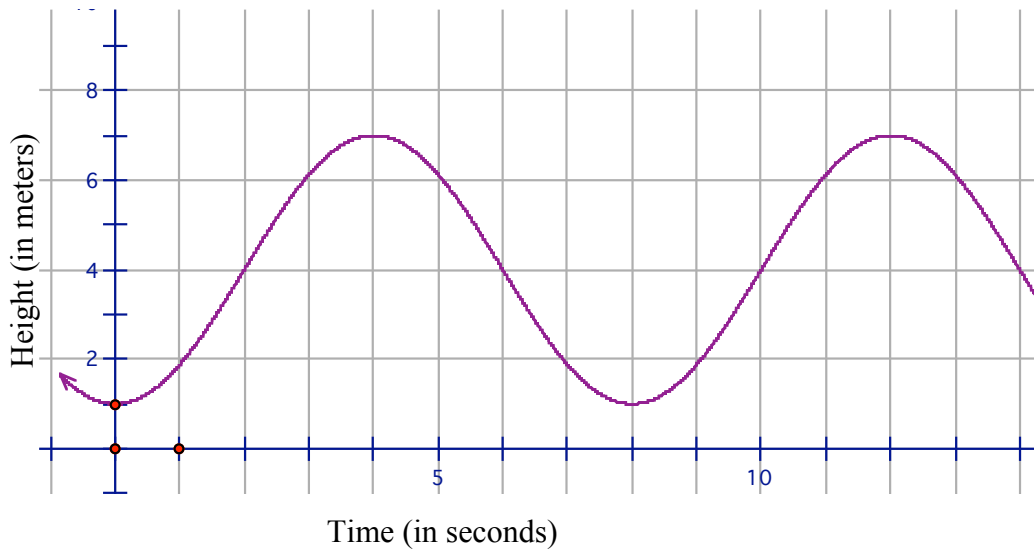
[5 marks]

Trigonometric formula:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

B18. The graph shows a person's height above the ground in terms of time while riding a Ferris wheel.



- A. What is the period of the function. [1 mark]
- B. What does the period represent. [1 mark]
- C. What is the diameter of the Ferris wheel? How do you know? [2 marks]
- D. Approximately how high above the ground is the person at 10 s. [1 mark]
- E. At what times is the person at the top of the Ferris wheel? [1 mark]
- F. When is a person 4 m above the ground? [1 mark]