

Name: \_\_\_\_\_

### MCR 3U1 - PRACTICE EXAMINATION

**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 should be completed after you have completed the final exam review so that you can get a feel for how long your exam will be.**

**PART A: Fill in the blanks**

**Place the simplified answer in the space provided. 1 mark each = 30 marks total**

1. For each of the following:

(i) Determine which relations are *functions*. Give a reason to support your answer.

(ii) State the *domain* and *range*. Write your answer in *set notation*.

(a)  $y = 2|x + 1| + 5$

(i) Function (yes or no) \_\_\_\_\_

Reason: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(b)  $y = 3^{x+5} - 4$

(i) Function (yes or no) \_\_\_\_\_

Reason: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(ii) D = \_\_\_\_\_

R = \_\_\_\_\_

(ii) D = \_\_\_\_\_

R = \_\_\_\_\_

2. For the function  $f(x) = \frac{x+2}{x+5}$ ,  $f(-4) =$  \_\_\_\_\_

3. Factor :  $6x^2 - 5x - 4 =$  \_\_\_\_\_. (Give only your final answer)

4. Determine the exact value of:

(a)  $\sin 45^\circ =$  \_\_\_\_\_

(b)  $\cos 30^\circ =$  \_\_\_\_\_

5. Determine two values of  $\theta$ ,  $0 \leq \theta \leq 360^\circ$  so that:  $\cos \theta = -0.9063$       $\theta =$  \_\_\_\_\_ or  $\theta =$  \_\_\_\_\_

6. Simplify:

(a)  $\sqrt{75} =$  \_\_\_\_\_

(b)  $2\sqrt{6} + 5\sqrt{3} - \sqrt{6} + 4\sqrt{3} =$  \_\_\_\_\_

7. Evaluate:

(a)  $(\sqrt[3]{125}) =$  \_\_\_\_\_

(b)  $(32)^{\frac{6}{5}} =$  \_\_\_\_\_

(c)  $\left(\frac{3}{4}\right)^{-2} =$  \_\_\_\_\_

8. For the series  $S = 30 + 26 + 22 + 18 + \dots$ , state:

(i)  $a =$  \_\_\_\_\_    (ii)  $d =$  \_\_\_\_\_    (iii)  $t_n =$  \_\_\_\_\_    (iv)  $t_{10} =$  \_\_\_\_\_

9. For the series  $S = 2 - 8 + 32 - 128 \dots$ , state:

(i)  $a =$  \_\_\_\_\_    (ii)  $r =$  \_\_\_\_\_    (iii)  $t_n =$  \_\_\_\_\_    (iv)  $t_{10} =$  \_\_\_\_\_

10. "Emily is investing \$128000 at 7.8%/a compounded monthly. She wants to withdraw an equal amount of money from this investment each month for the next 25 years as spending money. What is the most she can take out each month?" Complete the TVM solver screenshot to answer this question. You do not need to actually solve the problem, just fill in the appropriate values and put a question mark in the place where you're solving.

[3 marks]

N=  
I/Y=  
PV=  
PMT=  
FV=  
P/Y=  
C/Y=  
PMT:  END  BEGIN

**PART B: Full Solutions****All steps must be shown. Marks will be deducted for poor form. 60 marks total****Marks**

- ③ 1. Expand and simplify: *(You may not need to use all the lines provided.)*

$$(3x + 2)(x^2 - 5x + 2) + (2x - 1)^3$$


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- ④ 2. Factor:

(a)  $3x(2x - 3) - 5(3 - 2x)$

(b)  $3x^2 - 3xy + 12xz - 12yz$

3. Simplify. Where applicable, write your final answer with positive exponents only.

③ (a)  $\frac{x^2 + 4x + 4}{3x + 9} \times \frac{x^2 - 9}{2x^2 - 2x - 12}$

③ (b)  $\frac{2x + 1}{x^2 + 3x - 4} - \frac{4}{x^2 - 1}$

③ (c)  $\sqrt{12} + 8\sqrt{75} - 5\sqrt{108}$

③ (d)  $(4 + 5\sqrt{3})(1 - 2\sqrt{3})$

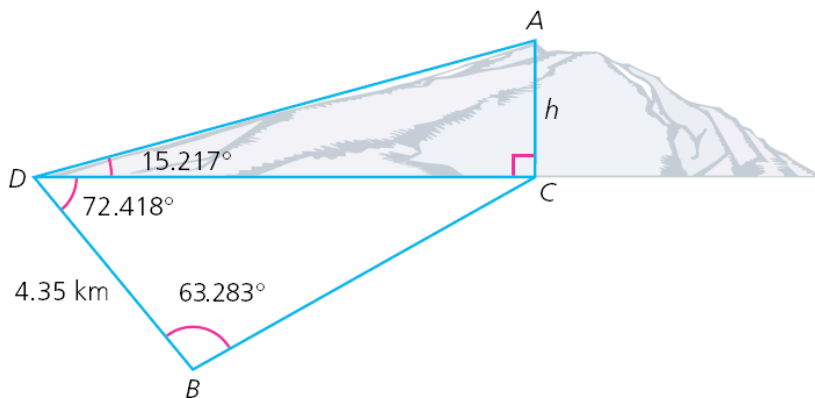
③ (e)  $(4m^{-3}n^6)^2(2m^5n^{-4})^3$

③ (f)  $\sqrt[3]{\frac{81x^4y^{-7}}{3x^{-5}y^5}}$

- ④ 4. The profit function for a business is given by the equation  $P(x) = -4x^2 + 16x - 7$ , where  $x$  is the number of items sold, in thousands, and  $P(x)$  is the dollars in thousands. Calculate the maximum profit and how many items must be sold to achieve it.

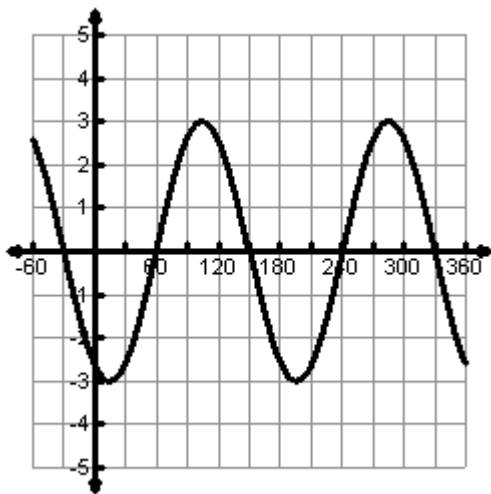
- ③ 5. (a) Given  $f(x) = 2x^2 - 12x + 5$ , determine the equation of  $f^{-1}(x)$ .

- ④ 6. A surveyor uses a diagram to help determine the height,  $h$ , of a mountain. Determine the height of the mountain,  $h$ .



③ 7. Prove the following identity:  $\sin^2 x + \frac{\sin x \cos x}{\tan x} = 1$ .

④ 8. Determine the equation of a trig function that models the graph.



④ 9. (a) Expand and simplify:  $(2x - 3y)^5$

④ (b) Melissa's parents start to save for her education by depositing \$100.00 per month into an account that pays 9% / a, compounded semi-annually. Determine the value of the account after 17 years.

10. For each of the following:

- (a) Complete a table of values for the “key” points.
- (b) Sketch the starting function.
- (c) Write a mapping formula.
- (d) Determine the translated “key” points.
- (e) Sketch the new graph.

④ (i)  $f(x) = 2^{2(x-3)} - 5$

(a)

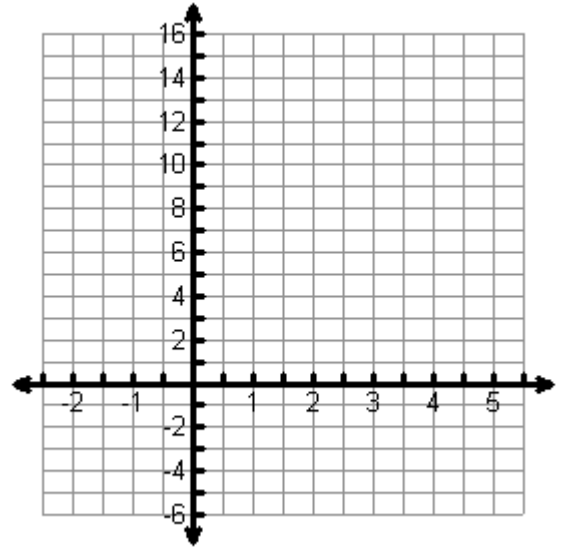
$x$	$f(x) = 2^x$
-2	
-1	
0	
1	
2	
3	
4	



(d)

$x$	$f(x) = 2^{2(x-3)} - 5$

(b) & (e)

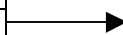


(c)  $(x, y) \rightarrow$  \_\_\_\_\_

⑤ (ii)  $y = 4\sin(3x + 90^\circ) - 5$

(a)

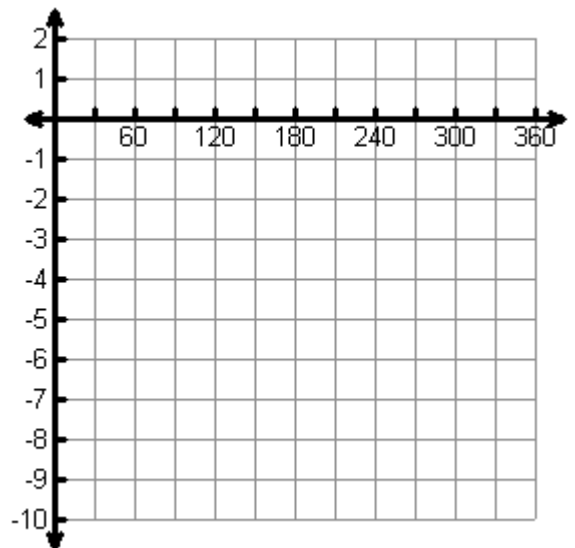
$x$	$y = \sin x$
0	
$90^\circ$	
$180^\circ$	
$270^\circ$	
$360^\circ$	



(d)

$x$	$y = 4\sin(3x + 90^\circ) - 5$

(b) & (e)



(c)  $(x, y) \rightarrow$  \_\_\_\_\_