



# **Pre-Calculus 12**

## **Resource Exam B**

### **Exam Booklet I**

**Multiple-Choice and Written-Response Questions**  
**Calculator Permitted**

#### **Instructions**

1. When answering questions in Booklet I:
  - calculators are permitted for the first 45 minutes.
  - you will be able to continue in Booklet I after 45 minutes, but without the use of a calculator.
2. When using a calculator:
  - round final answers with decimals to at least two decimal places unless otherwise indicated in the question.
3. Once the calculator is put away, Booklet II will be handed out.
4. Diagrams are not necessarily drawn to scale.
5. You may use the provided Formula Page for reference.



**MULTIPLE-CHOICE QUESTIONS**  
**(Calculator permitted)**

**Value: 21 marks**

**INSTRUCTIONS:** For each question, select the **best** answer.

You have a maximum of 45 minutes to work with your calculator. After 45 minutes you will be allowed to continue in Booklet I but without the use of a calculator.

**Note: some of the written-response questions in the Written-Response section may require the use of a calculator and should be completed within the first 45 minutes.**

1. Solve:  $\cos 3x = \sin x$ ,  $0 \leq x \leq \frac{\pi}{2}$

- A. 0.39
- B. 0.40, 1.25
- C. 0.79
- D. 0.79, 1.18

2. Determine the equation of a circle with centre  $(0, 0)$  passing through the point  $P(-2, 5)$ .

- A.  $x^2 + y^2 = 3$
- B.  $x^2 + y^2 = 9$
- C.  $x^2 + y^2 = 21$
- D.  $x^2 + y^2 = 29$

3. Determine the measure of the standard position angle  $\theta$  if the point  $P(-4, 3)$  is on the terminal arm of angle  $\theta$ , where  $0^\circ \leq \theta < 360^\circ$ .
- A.  $37^\circ$   
B.  $53^\circ$   
C.  $127^\circ$   
D.  $143^\circ$
4. Express as a single logarithm:  $\log a - \log b - 3 \log c$
- A.  $\log \frac{a}{bc^3}$   
B.  $\log \frac{a}{b^3c^3}$   
C.  $\log \frac{ac^3}{b}$   
D.  $\log \frac{ac^3}{b^3}$
5. Determine the  $x$ -intercept of the function  $y = 5^x - 3$ .
- A.  $-2$   
B.  $0.008$   
C.  $0.6$   
D.  $0.68$
6. An investment earns  $2.25\%$  per annum compounded daily. How many years would be required for an investment to triple in value? Assume all years have 365 days.
- A.  $4.88$   
B.  $5.41$   
C.  $48.83$   
D.  $49.37$

7. Determine the number of different arrangements of all the letters in the word TRIGONOMETRY.

- A. 4 989 600
- B. 59 875 200
- C. 119 750 400
- D. 479 001 600

8. An area code is the first 3 digits in a phone number and indicates the location of either the province or the city. In Canada, the following area codes exist:

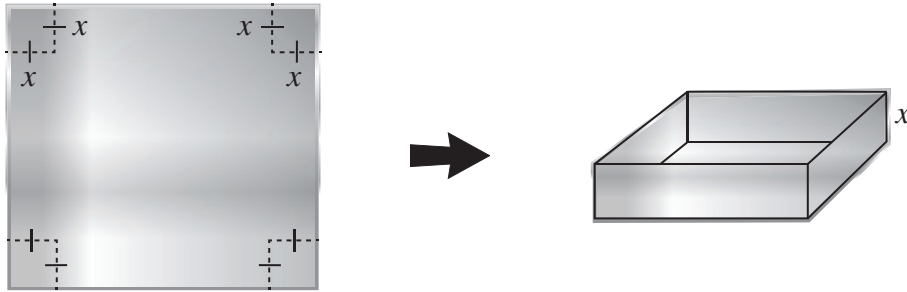
Manitoba	204	Ontario	519, 613, 705, 807
Saskatchewan	306	Yukon and NW Territories	867
Québec (Québec City)	418	Toronto (Ontario)	289, 647
Montreal	514	Ontario (Toronto Metro)	416
Newfoundland	709	New Brunswick	506
Québec	450, 819	Alberta	780
British Columbia	250, 604, 778	Nova Scotia	902
Alberta (south)	403		

Notice that there are 3 area codes for British Columbia: 250, 604 and 778. It will be necessary to add another area code as the population increases. The new area code cannot be the same as an existing code, it must begin with a 3 and end in an even number. Determine the number of possible area codes to choose from.

- A. 40
- B. 44
- C. 49
- D. 50

9. In a standard deck of 52 cards, determine the number of 5-card hands that must contain at least 3 queens.
- A. 4512
  - B. 4560
  - C. 4704
  - D. 4752
10. A dance group has twelve people from which five need to be chosen to compete in a national competition. Bob and Nancy are in the group of twelve and have recently obtained gold at a regional competition. They are therefore required to be among the five selected for the national competition. Given this requirement, how many different five-member teams are possible?
- A. 120
  - B. 220
  - C. 252
  - D. 792
11. Determine the 5th term in the expansion of  $(3x + 2y)^n$ , where  $n \geq 6$ .
- A.  ${}_n C_4 (3x)^{n-4} (2y)^4$
  - B.  ${}_n C_5 (3x)^{n-5} (2y)^5$
  - C.  ${}_n C_4 (3x)^4 (2y)^{n-4}$
  - D.  ${}_n C_5 (3x)^5 (2y)^{n-5}$

12. A sheet of metal  $12\text{ cm} \times 12\text{ cm}$  will be used to make an open-top box by removing a square of length  $x$  in each corner and turning up the sides as shown in the diagram.



What is the volume of the box as a function of  $x$  ?

- A.  $V = x^3$
  - B.  $V = x(12 - x)^2$
  - C.  $V = 144 - 4x^2$
  - D.  $V = x(12 - 2x)^2$
13. Determine all solutions for the equation  $\sqrt{x + 4} = 3x$  .
- A.  $-0.61, 0.72$
  - B.  $-0.61$
  - C.  $0.72$
  - D.  $1.33$

14. Which equation represents the graph of  $f(x)$  after it has been horizontally stretched by a factor of  $\frac{1}{2}$ ?

A.  $y = f(2x)$

B.  $y = 2f(x)$

C.  $y = f\left(\frac{1}{2}x\right)$

D.  $y = \frac{1}{2}f(x)$


**This is the end of the Multiple-Choice section.  
Answer the remaining questions directly in the Written-Response section.**



**WRITTEN-RESPONSE QUESTIONS**  
**(Calculator permitted)**

**Value: 16 marks**

**INSTRUCTIONS:** Answer the following questions in the space provided.


Any questions with a  symbol should be attempted within the first 45 minutes while you have access to a calculator. After 45 minutes you will be allowed to work on this section but without the use of a calculator.

Rough-work space has been incorporated into the space allowed for answering each question. You may not need all the space provided to answer each question.

When using the calculator, you should provide a decimal answer that is **accurate to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

When asked to provide explanations, you are encouraged to use sketches, diagrams or examples to support your work. You will be evaluated on the concepts expressed, the organization and accuracy of your work, and your use of language.

**Full marks will NOT be given for a final answer only.**

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1. A food sample contains 300 bacteria. The doubling time for bacteria left at room temperature is 20 minutes. How many minutes will it take to reach an unsafe level of 100 000 bacteria?

Solve algebraically using logarithms. Answer must be written as a decimal accurate to at least 2 decimal places.

**(4 marks)**



2. Given  $\sin \alpha = \frac{1}{5}$ , where  $\alpha$  is in quadrant I and  $\cos \beta = \frac{2}{3}$  where  $\beta$  is in quadrant IV, determine the exact value of  $\sin(\alpha - \beta)$ .

**(4 marks)**



3. Prove algebraically:

(4 marks)

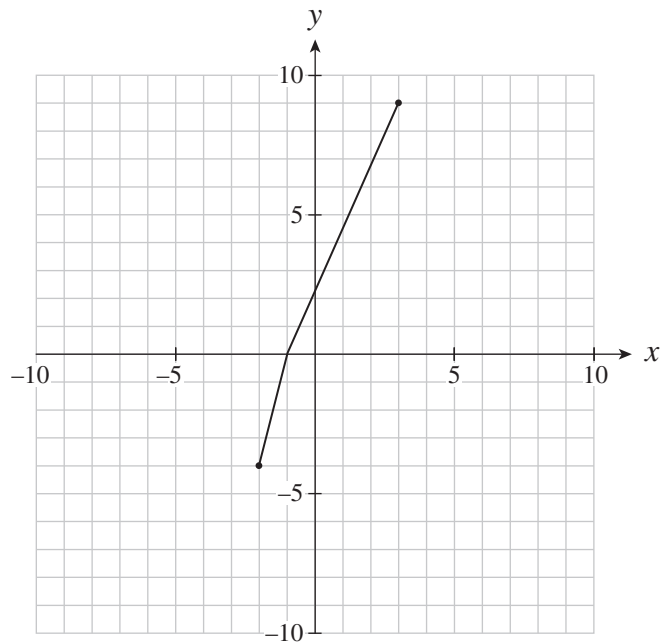
$$\frac{\cos \theta}{1 - \sin \theta} = \sec \theta + \sec \theta \csc \theta - \cot \theta$$

LEFT SIDE

RIGHT SIDE



4. The graph of  $y = f(x)$  is sketched below. Determine the domain and range of  $y = \sqrt{f(x)}$  and explain how this was determined. **(4 marks)**





**End of Examination Booklet I**

