St. Andrew's College
MCR3U
Grade 11
MATHEMATICS FINAL EXAM
(2 Hours)

Thursday, June 8, 2006
9:00 to 11:00 am

Name:________________________

Teacher:______________________

General Instructions

1. Part A answers are to be indicated on the answer page (page 2).
2. Part B and C require complete solutions with all of your work shown.
3. Part C – You are to answer 4 of the 5 questions given.
4. All answers are to be written in the spaces provided.
5. TI-83$^+$ /84 calculators are permitted
6. **Disqualification** from the test will result if you bring books, paper notes or unauthorized electronic devices into the examination room.
7. When instructed to open this examination booklet, check the number of the pages to ensure that you have 13 pages.

This exam consists of three parts:	Value	Suggested Time
Part A: KNOWLEDGE 15 multiple-choice questions.	**15**	**20 min**
Part B: APPLICATION 12 Short Answer- work needs to be shown.	**31**	**50 min**
Part C: THINKING/INQUIRY **Choose 4 of the 5 Long Answer questions** – complete solutions including all proper labels, conclusions need to be shown.	**24**	**50 min**

Part A Answer Sheet. Clearly indicate your choice in the space provided.

1. __________

2. __________

3. __________

4. __________

5. __________

6. __________

7. __________

8. __________

9. __________

10. __________

11. __________

12. __________

13. __________

14. __________

15. __________

Part A. Knowledge and Understanding. Circle the correct choice. [15 questions G 1 mark = 15 marks]

1. How many of the following statements show correct factoring?
   - $x^2-10x+24 = (x-6)(x-4)$
   - $x^2 - 36 = (x - 6)^2$
   - $x^2 - 22x + 484 = (x - 22)^2$
   - $x^2 + 5x + 6 = (x + 3)(x + 2)$

   a) 0 b) 1 c) 2 d) 3 e) 4

2. Simplify $\frac{x^2+10x+21}{(x-3)(x+3)}\cdot\frac{1}{x+7}$

   a) $\frac{x^2+14x+49}{x+7}$ b) $\frac{x+3}{x-3}$ c) $\frac{(x^2+49)}{x+7}$ d) $\frac{x}{7}$ e) $\frac{1}{x-3}$

3. State the restrictions on the rational expression $\frac{4x^2+3x}{5x^2+10x}$.

   a) -5, -10 b) -2 c) 0, -2 d) 5, 10 e) -10

4. Simplify $2\sqrt{3}\times3\sqrt{12}$

   a) $5\sqrt{36}$ b) $5\sqrt{15}$ c) $6\sqrt{15}$ d) 36 e) none of these

5. Using $y = x^2$ as the initial graph, the function $y = \frac{1}{5}(x)^2$ can be thought of as a:

a) horizontal expansion by a factor of 5.
b) horizontal compression by a factor of 5.
c) vertical expansion by a factor of 5.
d) vertical compression by a factor of 5.
e) horizontal shift of 5 units to the right.

6. An equivalent value to $\frac{\cos x\tan x}{\sin x}$

   a) $\tan^2 x$ b) 1 c) -1 d) $\frac{\cos^2 x}{\sin^2 x}$ e) none of these

7. In which quadrant does the terminal ray of the angle with standard position angle of 225° lie?

   a) I b) II c) III d) IV e) there is no terminal ray

8. Identify the phase shift for the equation $y = -\frac{2}{3}\cos(2x-90)+2$

   a) 90 to the left b) 45 to the left c) 90 to the right d) 45 to the right

10. Find the value of c that will make the expression $x^2 + 5x + c$ perfect square trinomial

a) 25 b) 12.5 c) 10 d) 6.25 e) 2.5

11. How many terms are in the sequence $\frac{1}{16}, \frac{1}{4}, 1, 4, ..., 65536$

a) 5 b) 10 c) 11 d) 12 e) 22

12. Write the first three terms of the sequence defined by the recursive formula:

$t_1 = 5$

$t_n = 5(t_{n-1} - 2)$, $n>1$

a) 5, 0, 5 b) 5, 15, 45 c) 5, 3, 1 d) 5, 15, 65 e) 5, 35, 245

13. State the 100th term in the sequence 7, 10, 13, …

a) 296 b) 300 c) 304 d) 100 e) 308

14. How many compounding periods are there for a loan that is compounded quarterly for 6 years?

a) 4 b) 24 c) 6 d) 1 e) $\frac{1}{4}$

Part B. Application. To earn full marks, all work must be shown in each of these questions.

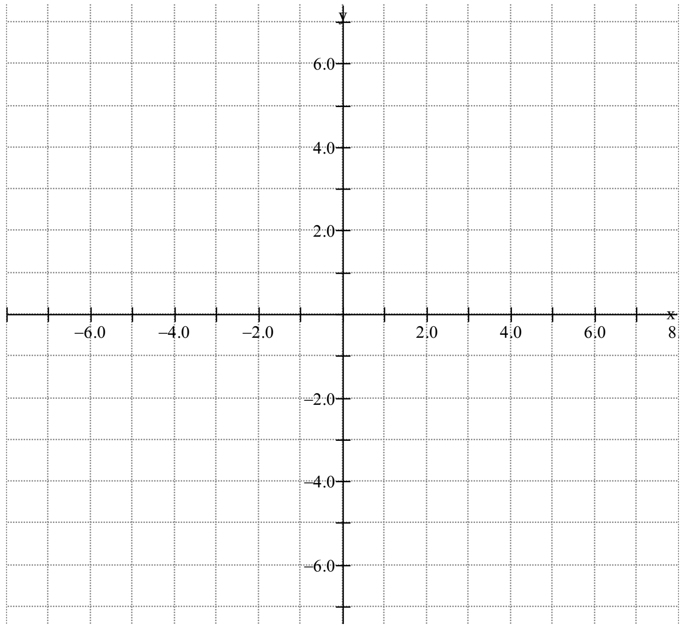
2. Simplify.[3+3 marks]

a) $\frac{m}{2m-4}-\frac{3}{3m-6}$

3. Solve and fully simplify your answer.[3 marks]

$x^2 + 4x + 2 = 0$

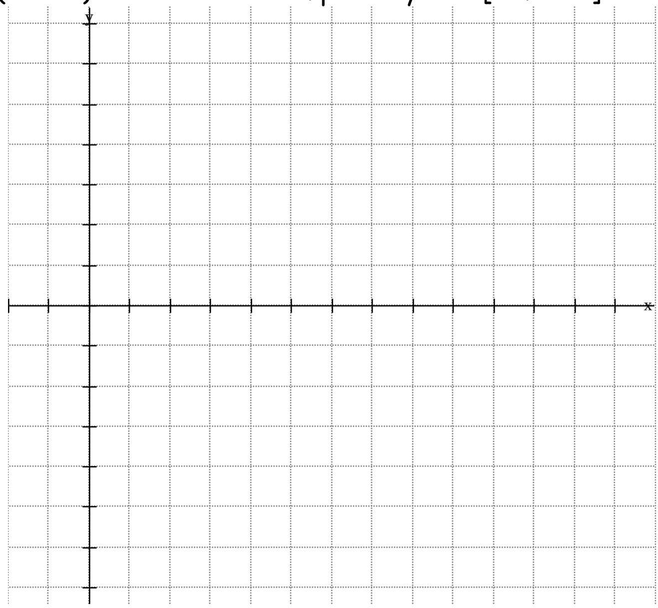
4. a) Graph f(x) and it's inverse if $f(x) = -x^2 + 2$.[5 marks]



b) Determine the algebraic representation of the inverse.

c) Explain what is meant by an inverse function.

5. Graph y = - cos2(x - 60) and show two complete cycles. [2 marks]



6. If θ =330°, find the exact values of sin θ, cos θ, and tan θ.[2 marks]

8. Given a geometric series where $t_5=12$ and $t_8=96$. Find t_n and S_{10} .[3 marks]

9. Mr. Jones wants to set up a fund for his new son, Levi – assume age 0. The goal is to have $1 000 000 when Levi turns 65. How much needs to be invested each month at 8% per annum compounded monthly in order to achieve this goal? Write the equation but do not simplify. [2 marks]

____

Part C. Application and Thinking, Inquiry/Problem Solving. Properly presented solutions that show necessary detail are required to earn full marks. **Do 4 of the 5 questions presented.**
[4 questions G 6 marks = 24 marks]

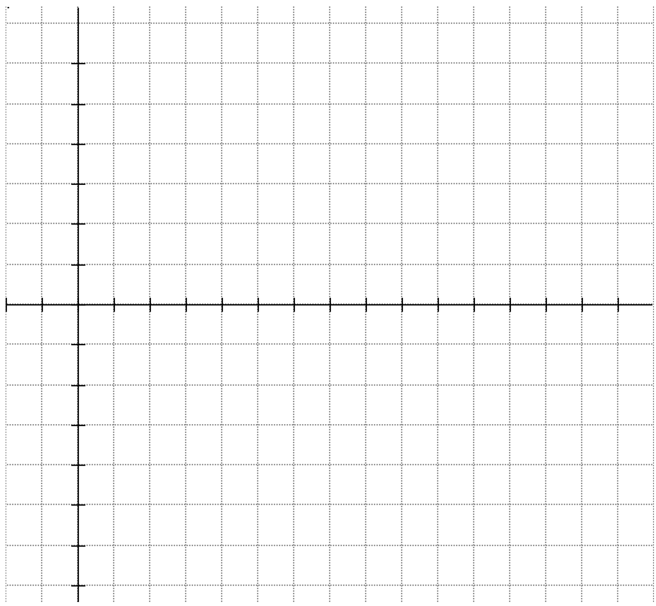
1. Find the sides and angles of all triangles $\triangle ABC$ where AB is 12.8cm, AC is 20.5 cm and $\angle ACB = 29.3^\circ$. Round your answers to the nearest tenth of a centimetre.

2. A buoy rises and falls as it rides the waves. The equation h(t) = cos 36t models the displacement of the buoy in metres at t seconds.

a) Graph the displacement from 0 to 20s, in 2.5s intervals.

b) Determine the period of the function.

c) At what time, to the nearest second, does the displacement first reach -0.8m?



3. Determine the area of a triangle who vertices are the vertex and the zeros of the parabola $y = x^2-8x+12$.

4. Jeff can finance his retirement in two ways:

- Plan A: Beginning immediately, he can make a year-end deposit of $3000 at 5.5% per annum compounded annually, each year for 10 years. He will then invest that amount for the next 30 years at 5.5% per annum compounded annually, when he hopes to retire.
- Plan B: Beginning 10 years from now, he can make year-end deposits of $3000 earning interest at 5.5% per annum compounded annually. He does so for 30 years, when he hopes to retire.

Which plan costs him more? Which plan should he choose? Justify your answers.

5. A new lottery offers two choices to the grand prize winner.

- Option A: \$1 000 000 day 1, \$2 000 000 day 2, \$3 000 000 day 3. The prize increases \$1 000 000 each day for 30 days.
- Option B: \$1 day 1, \$2 day 2, \$4 day 3. The prize doubles in value each day for 30 days.

Which option would you choose? Justify your answer giving three comparisons to support your selection. Explain why the total amount won by each prize differs so greatly.

Formula Sheet

$$t_n = a + (n-1)d$$

$$t_n = ar^{n-1}$$

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$S_n = \frac{n}{2}\left(a + t_n\right)$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$A = \frac{R\left[(1+i)^n - 1\right]}{i}$$

$$PV = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$