UNIVERSITY WORK.

MATHEMATICS.

ARCHIBALD MACMURCHY, M.A., TORONTO, EDITOR.

UNIVERSITY OF TORONTO.

ANNUAL EXAMINATIONS, 1882.

Junior Matriculation.

MATHEMATICS.

Examiner—F. Hayter, B.A.

1. The interest on a sum of money for two years is \$349.58, and the discount on the same sum for the same time is \$310.74; simple interest in both cases. Find the rate per cent., and the time.

2. *A* in Toronto pays *B* in Paris 1000 francs by a bill of exchange on London, exchange at Paris being 25.25 francs for £1 sterling. Find the amount of the bill, and its value in currency (£1 = \$4.86⅔). When the bill reaches Paris exchange is at 25.23. Find the amount in francs for which the bill sells.

3. Simplify

(i.) $\dfrac{x^2-15x+54}{x^2-7x+10}\times\dfrac{x^2-5x}{x^2-2x-63}\times\dfrac{x^2+5x-14}{x^2-6x}$.

(ii.) $\dfrac{2\sqrt{2}+\sqrt{3}-1}{\sqrt{3}+1}-\dfrac{\sqrt{2}-1}{\sqrt{2}+\sqrt{3}}-\dfrac{2\sqrt{2}+\sqrt{3}-1}{\sqrt{3}+1}\times\dfrac{\sqrt{2}-1}{\sqrt{2}+\sqrt{3}}$.

4. Divide $a^{4n-1}-a^{2n-1}+2a^{2n-2}-a^{2n-3}$ by $a^{2n}+a^n-a^{n-1}$.

Divide by Horner's method

$x^8+5x^6+11x^4+19x^2-36$ by $x^4-2x^3+2x^2+2x-3$.

5. Find L. C. M. of $(4x^3-4ax^2)$, $(3x^2-9ax+6a^2)$, and $(2x^3-8a^2x)$.

6. If the minute hand of a clock be 4 inches long and the hour hand 3 inches, find the times between 4 and 5 o'clock when their ends are 5 inches apart.

7. Solve

(i.) $\sqrt{1+x^2}+x=a$.

(ii.) $\begin{cases}12x-13y=7\\144x^2-156xy+169y^2=4729.\end{cases}$

(iii.) $\begin{cases}x+y=z\\x^2+z^2=29\\xy=6.\end{cases}$

8. The opposite sides and angles of a parallelogram are equal to one another.

The diagonals of a parallelogram bisect each other. The angle between the diagonals of a rhombus is a right angle.

9. Upon the same straight line, and upon the same side of it, there cannot be two similar segments of circles, not coinciding with one another.

Similar segments of circles upon equal straight lines are equal to one another.

ALGEBRA.—HONORS.

Examiner—A. K. Blackadar, B.A.

1. Find the sum, the product, and the least common multiple of the fractions:

$$\frac{1+x\sqrt{2}}{2(1+x\sqrt{2}+x^2)},\quad \frac{1-x\sqrt{2}}{2(1-x\sqrt{2}+x^2)},\quad \frac{1+x^2}{1+x^4}.$$

2. If $2s=a+b+c$, shew that

$$(c^2+a^2-b^2)(a^2+b^2-c^2)+(a^2+b^2-c^2)(b^2+c^2-a^2)+(b^2+c^2-a^2)(c^2+a^2-b^2)=16s(s-a)(s-b)(s-c).$$

Find the factors of

$$(x^2-1)(y^2-1)(z^2-1)-(xyz+1)(x^2+y^2+z^2+2xyz-1).$$

3. Given $3-\sqrt{5}$ as one root of the equation $ax^2+bx+c=0$, prove that $3+\sqrt{5}$ will be the other root; and find the values of the roots of $cx^2+bx+a=0$.