

**DAWSON COLLEGE – WINTER 2005**  
**MATHEMATICS DEPARTMENT**

**FINAL EXAMINATION**  
**MATHEMATICS 201-009-50**  
**(Functions & Trigonometry)**

**Marks**

- (4) 1. Perform the division:  $\frac{3x^4 - 6x^2 + 9x - 5}{3x + 3}$ . Express the answer as a polynomial plus a rational expression.
- (4) 2. Factor the polynomial:  $3m^2 - 14m + 8$ .
- (4) 3. Simplify to a single fraction:  $\frac{3x}{x^2 + x - 12} - \frac{x}{x^2 - 16}$ .
- (4) 4. Simplify the quotient:  $\frac{4a + 12}{2a - 10} \div \frac{a^2 - 9}{a^2 - a - 20}$ .
- (4) 5. Simplify the complex fraction in lowest terms:  $\frac{\frac{1}{x+1} - \frac{1}{x}}{\frac{1}{x}}$ .
- (4) 6. Simplify (positive exponents only in your answer):  
$$\left(\frac{16m^3}{n}\right)^{1/4} \left(\frac{9n^{-1}}{m^2}\right)^{1/2}$$
- (3) 7. Rationalize the denominator:  $\frac{\sqrt{r}}{3 - \sqrt{r}}$ .
- (4) 8. The perimeter of a rectangle is 84 cm. The length is 11 cm. Find the width.

- (5) 9. Consider the points  $P(-3, 4)$  and  $Q(2, -2)$ .
- Find the distance from P to Q.
  - Find the midpoint of the line segment PQ.
  - Find the slope of the line passing through P and Q.
- (4) 10. Solve for  $x$ :  $x^2 + 2x = 5$ .
- (3) 11. Solve for  $x$ :  $\frac{3x-1}{3} - \frac{2x}{x-1} = x$ .
- (3) 12. Find the equation of the line through point  $(-6, 4)$  and perpendicular to the line  $3x + 4y = 7$ .
- (4) 13. If  $f(x) = -5x + 3$  find (a)  $f^{-1}(x)$  (b)  $f^{-1}(2)$ .
- (4) 14. If  $f(x) = x^2 - 2x + 2$ ,  $g(x) = 2/x$  find
- $(f \circ g)(-1)$
  - $\frac{f(x+h) - f(x)}{h}$ .
- (4) 15. Sketch the graph of  $y = \begin{cases} x+2 & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$ .
- (4) 16. Solve for  $x$ :
- $\log_x 16 = 2$
  - $\log_{10}(x+1) - \log_{10} x = \log_{10} 3$ .
- (2) 17. Express as a sum or difference of logarithms:  $\log_3 \left( \frac{x^2 \sqrt{y}}{z^{-4}} \right)$ .

- (4) 18. (a) Find  $\log_2 85$ .
- (b) Solve for  $x$ :  $7^{x-1} = 22$ .
- (4) 19. Graph the function  $f(x) = x^2 - 3x + 2$ . Clearly show on the graph the  $x$  and  $y$  intercepts, the line of symmetry and the co-ordinates of the vertex.
- (2) 20. State the radius and center of the circle
- $$(x+3)^2 + (y-4)^2 = 36.$$
- (4) 21. Find the exact value of each of the following without the use of a calculator.
- (a)  $\sec 495^\circ$  (b)  $\cot\left(-\frac{5\pi}{6}\right)$
- (3) 22. In  $\triangle ABC$ , if  $b = 100$ ,  $A = 58.43^\circ$ ,  $B = 90^\circ$ , find side  $a$ .
- (5) 23. State the amplitude and period, and graph one cycle of  $y = -3\sin 2x$ .
- (3) 24. Verify the identity:  $\sec^2 \theta \cot^2 \theta - \cos^2 \theta \csc^2 \theta = 1$ .
- (3) 25. Verify the identity:  $\sin\left(x + \frac{\pi}{2}\right) = \cos x$ .
- (4) 26. Without the use of a calculator find the exact value of  $\tan \theta$  given  $\sin \theta = -1/4$  with  $\theta$  in quadrant IV.
- (4) 27. Solve for  $x$  ( $0 \leq x < 2\pi$ ) given  $2\sin x \cos x - \sin x = 0$ .

## ANSWERS

## Marks

(4) 1.  $x^3 - x^2 - x + 4 + \frac{-17}{3x+3}$

(4) 2.  $(3m-2)(m-4)$

(4) 3.  $\frac{2x^2 - 9x}{(x-3)(x+4)(x-4)}$

(4) 4.  $\frac{2a+8}{a-3}$

(4) 5.  $-\frac{1}{x+1}$

(4) 6.  $\frac{6}{m^{1/4}n^{3/4}}$

(3) 7.  $\frac{3\sqrt{r}+r}{9-r}$

(4) 8. 31 cm

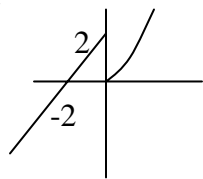
(5) 9. (a)  $\sqrt{61}$  (b)  $(-\frac{1}{2}, 1)$  (c)  $-\frac{6}{5}$

(4) 10.  $-1 \pm \sqrt{6}$  (3) 11.  $\frac{1}{7}$

(3) 12.  $y = \frac{4}{3}x + 12$  (4) 13. (a)  $\frac{-x+3}{5}$  (b)  $\frac{1}{5}$

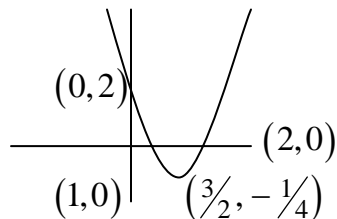
(4) 14. (a) 10 (b)  $2x + h - 2$

(4) 15. (4) 16. (a) 4 (b)  $\frac{1}{2}$



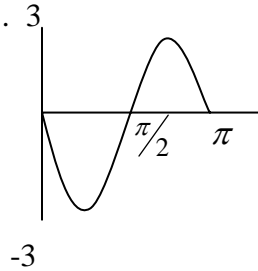
(2) 17.  $2\log_3 x + \frac{1}{2}\log_3 y + 4\log_3 z$  (4) 18. (a) 6.4093 (b) 2.5884

(4) 19. (2) 20. center  $(-3, 4)$  radius 6



(4) 21. (a)  $-\sqrt{2}$  (b)  $\sqrt{3}$  (3) 22. 85.20

(3) 23. 3 (3) 24.



(3) 25.

(4) 26.  $-\frac{1}{\sqrt{15}}$

(4) 27.  $0, \pi/3, \pi, 5\pi/3$   
 or  
 $0^\circ, 60^\circ, 180^\circ, 300^\circ$