DAWSON COLLEGE

MATHEMATICS DEPARTMENT

Applied Mathematics for Computer Science

201-920-DW 01 and 02
Winter 2022
Final Exam
May 24, 2022
Time Limit: 3 hours

Name: _____

Dawson ID#: _____

Instructors: KL, SS

- This test contains 12 pages (including the cover sheets) with 19 problems. Check to see if any pages are missing.
- Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page, and please indicate that you have done so.
- **Show complete solutions to get full marks**; – unless otherwise stated, reduce each answer to its simplest, exact form; – and write and arrange your solutions in a legible and orderly manner.
- If you would need a calculator, you are only permitted to use the **Sharp EL-531X*** models, or models that are approved by the instructor.
- This examination booklet must be returned intact.
- Good luck!

Question	Points	Score
1	4	
2	4	
3	5	
4	7	
5	5	
6	7	
7	4	
8	4	
9	5	
10	6	
11	4	
12	11	
13	10	
14	4	
15	3	
16	4	
17	4	
18	5	
19	4	
Total:	100	

Don't forget to write your name and Dawson ID number!

1. (4 points) Simplify the following and express the final result with positive exponents only:

$$\frac{(-2x^4y^2z^{-1})^3}{((-2x^{-1})^2y^{-1}z^2)^2}$$

2. (4 points) Divide by long division:

$$\frac{5x^3+12x^2+x-3}{x+2}$$

3. (5 points) Rationalize the denominator and simplify:

$$\frac{3\sqrt{2}-\sqrt{3}}{2\sqrt{2}+\sqrt{3}}$$

4. (7 points) Perform the operations and simplify:

$$\frac{x^2-x-20}{x^2-25}\cdot\frac{x^2-x-2}{x^2+2x-8}\div\frac{x+1}{x^2+5x}$$

5. (5 points) Solve for x:

$$\frac{1}{2}-\frac{2}{x^2-1}=\frac{1}{x+1}$$

6. (7 points) Solve for x:

$$\sqrt{3x-8}+\sqrt{x}=4$$

7. (4 points) Solve for x:

$$3^{1-4x}=7^{3x-4}$$

8. (4 points) Solve for x in $[0, 2\pi)$:

$$8\sin(x)\cos(x) + 3\cos(x) = 0$$

Reduce your answers to two decimal places, if necessary.

9. (5 points) Solve for x:

$$\tan^{-1}(x) - \sin^{-1}\left(\frac{5}{13}\right) = 0$$

Final result should not include any trigonometric or inverse trigonometric expressions.

10. Let $f(x) = \dfrac{-4}{x\sqrt{9-5x}}$.

(a) (3 points) Find the domain of f.

(b) (3 points) Find the exact value of $(f \circ f)(1)$, if it exists.

11. (4 points) Find the inverse and the range of $g(x) = \dfrac{2-x}{5x+3}$.

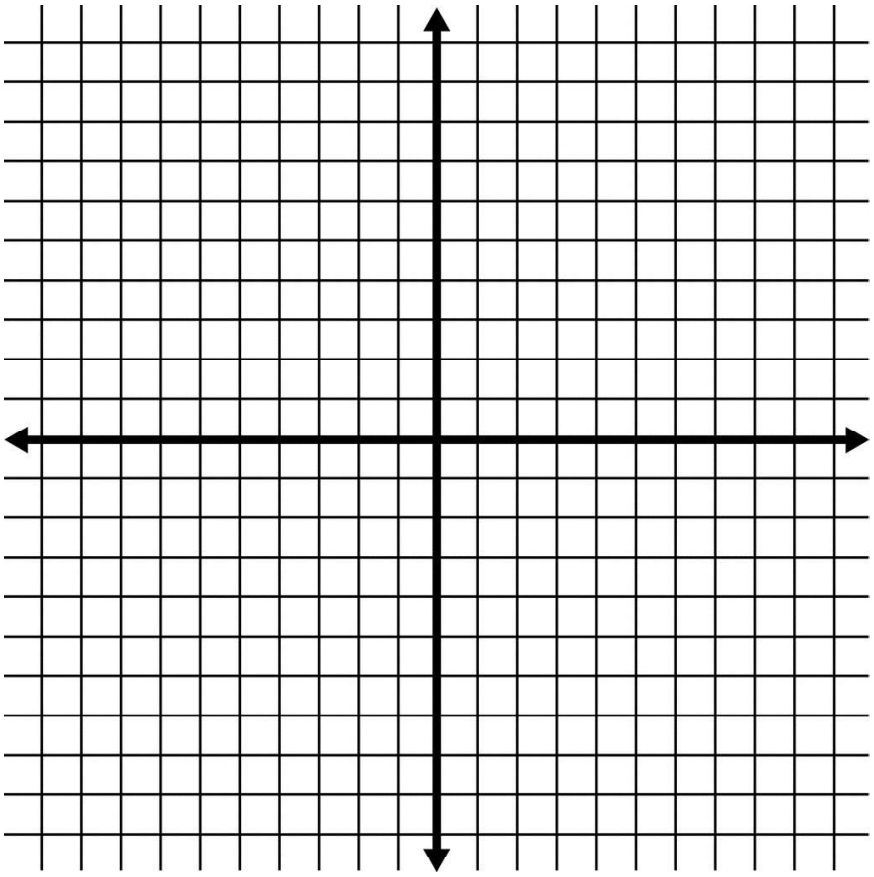
12. Let ℓ be the line with equation $7x - 3y = 21$.

(a) (3 points) Find the slope of ℓ. Also, find the x-intercept and the y-intercept of ℓ.

(b) (3 points) Give the equation of the line that is perpendicular to ℓ and passing through the point $(4, -1)$. Write the equation in the form $(y = mx + b)$.

(c) (2 points) Find the x-intercept and the y-intercept of the line in part (b).

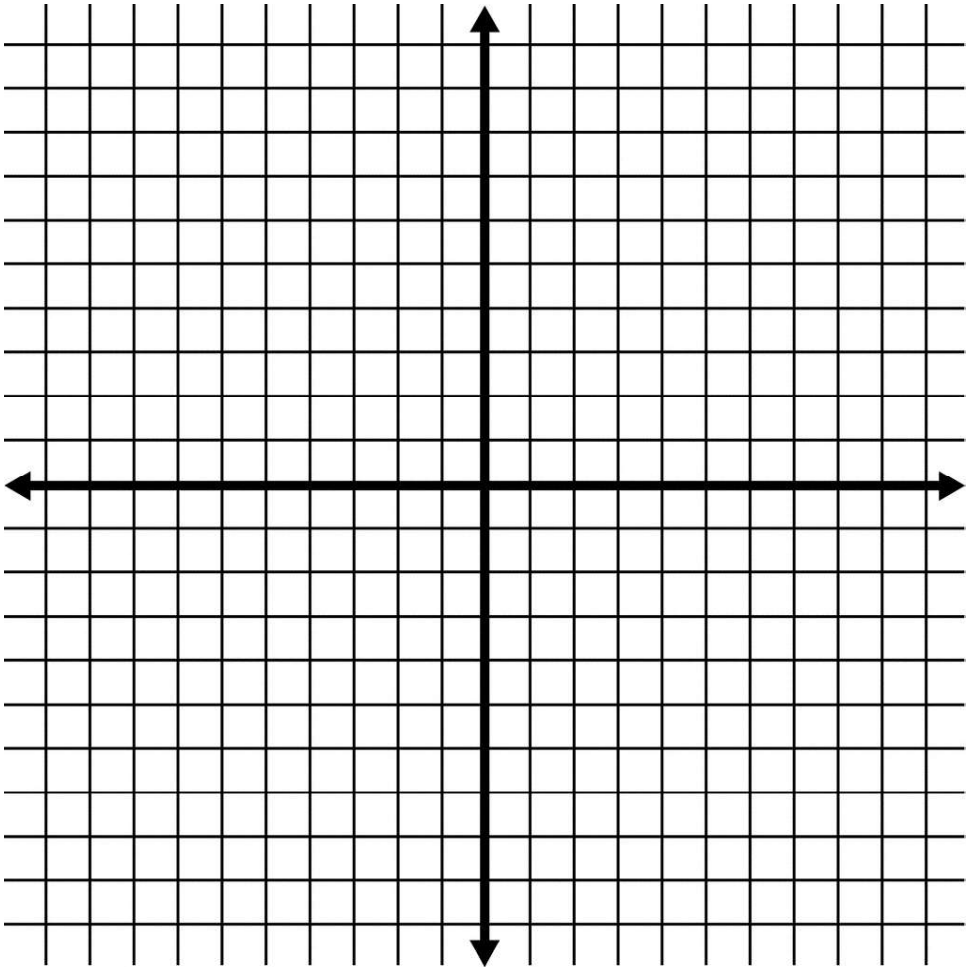
(d) (3 points) Sketch the graph of ℓ and the graph of the line obtained in part (b) on the grid below. Label the intercepts.



13. (10 points) Find the vertex and the intercepts of the parabola

$$y = x^2 - 4x - 5.$$

Then, sketch its graph. Label the vertex and the intercepts on the graph of the parabola. ALSO, label the point on the graph whose x-coordinate is 4.



14. (4 points) If $\log a = 8$, $\log b = 2$, and $\log c = 3$, find the the exact value of $\log\left(\dfrac{b\sqrt{a}}{c^{2/3}}\right)$.

15. (3 points) Establish the following identity:

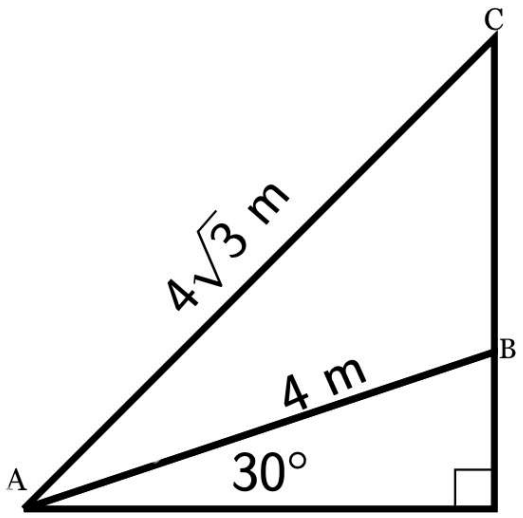
$$\sec(2x) = \frac{\cot x + \tan x}{\cot x - \tan x}$$

16. (4 points) The sum of three consecutive odd integers is -219. Find the integers.

17. (4 points) Use the Euclidean algorithm to find the greatest common divisor of 99 and 153.

18. (5 points) Solve the triangle ΔABC if $A = 30°$, $b = 12$ and $c = 4$. Also, find the area of this triangle. Reduce your answers to two decimal places, if necessary.

19. (4 points) Consider the following figure.



Solve the triangle ΔABC.