

TORONTO DISTRICT CHRISTIAN HIGH SCHOOL

FINAL EXAM

MATH 11 UNIVERSITY (MCR3U)

Jun 20, 2024

Name: _____

2 hours

Teacher: J. Templeton

| | <i>Mark Breakdown:</i> |
|---|------------------------|
| Knowledge and Understanding | 24 |
| Thinking | 24 |
| Communication (<i>including 4 for presentation</i>) | 10 |
| Application | <u>30</u> |
| Total: | 88 |

Notes:

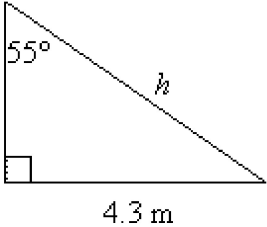
You must stay for the entire time.

You may use a ruler and/or a calculator.

Multiple Choice

K ___/7

Identify the choice that best completes the statement or answers the question.

- ___ 1. Which relation is not a function?
- $\{(-13, -10), (-15, -12), (-11, -8), (-16, 4)\}$
 - $\{(8, 17), (5, 5), (8, -3), (4, -1)\}$
 - $\{(-14, -2), (-10, 6), (-1, 3), (10, 6)\}$
 - $\{(0, -2), (-4, 6), (4, 15), (12, 6)\}$
- ___ 2. Evaluate $f(x) = 7 - 9x$ for $f(-3)$.
- 20
 - 6
 - 20
 - 34
- ___ 3. Which of the following is $5\sqrt{3}$ the simplified form of?
- $\sqrt{75}$
 - $\sqrt{30}$
 - $\sqrt{15}$
 - $\sqrt{125}$
- ___ 4. Which of the following is equivalent to the expression $\left(\frac{(3j^{-3}k^6)^4}{j^{-2}k^{-8}} \right)^{\frac{1}{2}}$?
- $\frac{j^{20}}{162k^{64}}$
 - $\frac{9k^{16}}{j^5}$
 - $\frac{9k^8}{j^5}$
 - $\frac{40.5k^{16}}{j^5}$
- ___ 5. Determine the length of the hypotenuse of the triangle to the nearest tenth of a metre.
- 
- ___ 6. If the first term of a sequence is 3 and the common difference is 4, what is the 23rd term in the sequence?
- 88
 - 87
 - 95
 - 91

9. Simplify fully. State the restrictions for each expression. [T:6,4]

a) $\frac{x^2-7x-30}{x^2-12x+20} \div \frac{6x^2+18x}{6x^3-12x^2}$

b) $\frac{4x}{x+1} + \frac{3}{x-2}$

10. Given the general quadratic function $f(x) = -3(x - 1)^2 + 2$ state: [K:1, C:2, T:2]

a) the vertex

b) the maximum or minimum value and why it's a max or a min.

c) The zeros of the quadratic (if it has any)

11. A ball is thrown from the roof of the school. The height of the ball is given by the function $h(t) = -5t^2 + 10t + 10.2$, where $h(t)$ is the height in metres and t is the time in seconds. Round your answers to two decimal places.

a) What is the height of the ball before it is thrown? [A: 1]

b) What is the maximum height of the ball and when does it reach it? (*hint – AoS*) [A: 3]

c) How long will it take for the ball to reach the ground? [A:2]

12. a) Express the following in radical form (do not evaluate): $(12^5)^{\frac{1}{3}}$ [K:1]

b) Simplify fully the radical expressions: [T:2,3]

i) $(6\sqrt{10})(-3\sqrt{18})$

ii) $-5\sqrt{20} + 2\sqrt{45} + 3\sqrt{24}$

13. The growth in population of a bacteria culture is given by the function $P(t) = 2500(1.09)^t$ where t is in hours. Determine:

a) The initial population at the beginning of bacteria. [K:1]

b) The growth rate of the culture [K:1]

c) The expected population of the culture after 24 hours [A:1]

d) Approximate how long it will take for the bacteria population to be doubled. [A:2]

14. Given the function: $f(x) = -\cos(2x - 120)^\circ + 1$, identify the period, central axis and phase shift. Also determine domain and range for two cycles of the sinusoidal function. [K:6]

Period = _____

Amplitude = _____

Central Axis = _____

Phase Shift = _____

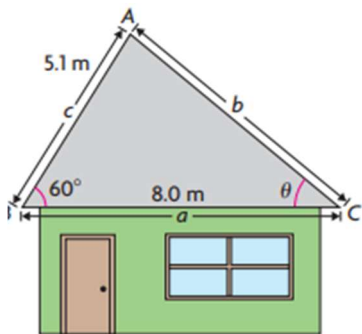
Domain:

Range:

15. a) For the angle $\theta = 225^\circ$, draw it in standard position and determine the related acute angle. Determine the exact value of $\sin(225^\circ)$. Draw a sketch [T:4]

b) Find both angles for $\cos(\theta) = -\frac{1}{2}$ between 0 and 360 degrees (draw a diagram). [T:3]

16. Mitchell wants his 8.0 wide house to be heated with a solar hot-water system. In order for the system to be effective, the system must be installed on the south side of the roof (the 5.1 m side in the diagram) and the roof needs to be inclined by 60° . If the angle, θ on the north side of the roof is inclined more than 40° then the roof will be too steep for Mitchell to install the system himself. Will Mitchell be able to install this system by himself? [A:4]



17. Prove $\frac{1}{\cos} - (\tan\theta)(\sin\theta) = \cos\theta$. [C:4]

18. If the 12th term of an arithmetic sequence is 25 and the first term is 3, determine t_{300} . [A:3]

19. Determine the recursive and the general formula for the geometric sequence.

Determine t_{12} and S_{12}

[A:4]

-2, 8, -32, ...

20. Frank has \$35,000 he wishes to invest. He finds a GIC which pays interest at a rate of 2.4%/a compounded quarterly. How much will his account be worth after 25 years, *and* how much interest did he earn? [A:3]

21. Julie decides to save \$1500 every month. For the next 25 years Julie deposits \$1500 every month in an account which pays 2.4%/a compounded monthly. At the end of the 25 years Julie stops saving the monthly \$1500 and decides to move her savings (as a lump sum) into an account which pays 4.0% compounded quarterly. She leaves her savings in the new account for 10 years. How much money has Julie managed to save in 35 years? [A:4]

22. Geddy wants an annuity to pay him \$1250 every month for the next 15 years. How much money does he need to invest today into an account which earns 1.2%/a compounded monthly? [A:3]

Folks – thanks for a good semester. Remember that God’s love for you is bigger than infinity. Blessings to each one of you.