TORONTO DISTRICT CHRISTIAN HIGH SCHOOL

FINAL EXAM

MATH 11 UNIVERSITY (MCR3U)

Jun 18, 2024 Name:_____

2 hours Teacher: J. Templeton

	Mark Breakdown:
Knowledge and Understanding	24
Thinking	24
Communication (*including 4 for presentation*)	10
Application	30
Total:	88

Notes:
You must stay for the entire time.

You may use a ruler and/or a calculator.

"For in Christ all the fullness of the Deity lives in bodily form, and you have been given fullness in Christ" – Col $2^{9\text{-}10a}$

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

a) $\frac{x^2+5x-14}{x^2-49} \div \frac{3x-6}{x^2-5x+6}$

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

10. Given the general quadratic function $f(x) = 2(x+3)^2 - 1$ 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): $(7^4)^{\frac{1}{5}}$ [K:1]

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

i) $\left(2\sqrt{14}\right)\left(-5\sqrt{7}\right)$

ii) $4\sqrt{50} - 5\sqrt{45} + 2\sqrt{18}$

13. The growth in population of a bacteria culture is given by the function $P(t) = 6000(1.07)^t$ 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: $f(x) = -\cos(2x - 120)^o + 1$, 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 = _____

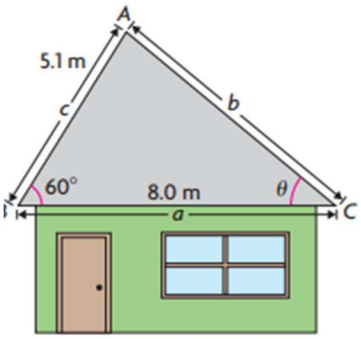
Phase Shift = _____

Domain: Range:

15. a) For the angle $\theta = 120°$, draw it in standard position and determine the related acute angle. Determine the exact value of cos(120°). Draw a sketch [T:4]

b) Find both angles for $\sin(\theta) = -\frac{\sqrt{3}}{2}$ 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 $5.1m$ 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 10th term of an arithmetic sequence is 32 and the first term is 5, 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. Helen has $75,000 she wishes to invest. Helen finds a GIC which pays interest at a rate of 3.6%/a compounded quarterly. How much will his account be worth after 25 years, ***and*** how much interest did she earn? [A:3]

21. Bernard decides to save $1000 every month. For the next 35 years he deposits $1000 every month in an account which pays 2.4%/a compounded monthly. At the end of the 35 years Bern stops saving the monthly $1000 and decides to move his savings (as a lump sum) into an account which pays 2.0% compounded quarterly. She leaves her savings in the new account for 10 years. How much money has Julie managed to save in 45 years? [A:4]

22. Melanie wants an annuity to pay her $750 every month for the next 10 years. How much money does she need to invest today into an account which earns 1.2%/a compounded monthly? [A:3]

Folks – have a wonderful summer. Thanks for a good semester. Remember that God's love for you is bigger than infinity. Blessings to each one of you.