

Canterbury High School
MCR 3U Final Examination

Friday, January 27, 2023

Time: 9:30 - 11:30 AM

Teacher: Mr Hughson

Name: _____

/78

Instructions:

1. There are 6 pages in this exam. Make sure all are present.
2. Non-graphing calculators are permitted. (no sharing)
3. Exact values are required except where indicated.
4. All solutions are to be done on the exam itself.
5. Scrap paper is provided for rough work and will not be graded.
6. Read all instructions and questions carefully before you begin each part.

PART A: Answer in space provided. Only the answer is needed. (37 marks)

1. If $f(x) = -2\sqrt{2x-1} + 5$, determine f(5). _____
2. For the function $y = -2(x+3)^2 + 7$, state the following:
 - (a) The vertex _____
 - (b) The y-intercept _____
 - (c) the max _____
 - (d) Domain _____
 - (e) Range _____
3. For the function $y = \frac{3}{x-1} + 2$
 - (a) What is the parent function _____
 - (b) What is the vertical stretch factor _____
 - (c) What is the horizontal translation _____
4. State the inverse of
 - (a) $f(x) = x - 3$ _____
 - (b) $f(x) = 3x$ _____
 - (c) $f(x) = x^2$ _____
5. Simplify the following
 - (a) $\frac{3x}{5x} =$ _____
 - (b) $\frac{x(x-3)^2}{x^2(x-3)} =$ _____

6. Factor (a) $5m^2 - 25m =$ _____

(b) $m^2 - 4m - 5 =$ _____

(c) $2x^2 + 3x - 9 =$ _____

7. For the function $f(x) = -2x^2 - 8x$ state _____

(a) the y-intercept _____

(b) the direction of opening _____

(c) the Zeros(x-intercepts) _____

(d) the vertex _____

8. Reduce the radical $\sqrt{12}$ _____

9. State the exact value of $\cos 60^\circ$ _____

10. State the related acute angle for 300° _____

11. For terminal arm created by the point P(-5, -6) _____

(a) State the exact value of $\cot \theta$ _____

(b) The value of the related acute angle (1 decimal place) _____

(c) The value of the principal angle θ (1 decimal place) _____

12. For the trig function $y = -3 \cos(10(x + 9)) + 2$ _____

(a) the phase shift _____

(b) the amplitude _____

(c) the period _____

(d) the axis _____

(e) the max _____

(f) the min _____

13. Simplify with positive exponents _____

(a) $\frac{3x^2}{27x}$ _____

(b) $\frac{(4x)^2}{2x^6}$ _____

(c) $\left(\frac{3x^{-1}}{x^3}\right)^{-2}$ _____

(d) $\frac{\sqrt[3]{x^4}}{\sqrt{x}}$ _____

PART B: Provide complete solutions. Clearly indicate your final answer. Express answers using **exact values** unless instructed otherwise. [41 marks]

$$1. \quad \text{Simplify} \quad \frac{m^2 - 4m - 5}{5m^2 - 25m} \div \frac{m^2 + 3m + 2}{15m^2}$$

[4]

2. Solve the following quadratic equations using the best method.

(a) $2x^2 - 9x - 5 = 0$ (b) $2x^2 + 2.7x - 5.1 = 0$

[6]

$$3. \quad \text{Simplify } (7\sqrt{2} + \sqrt{3})(7\sqrt{2} - \sqrt{3}) =$$

[2]

4. Nadia and Leah are playing baseball. Nadia pitches the ball to Leah and Leah hits the ball. t seconds after the ball is hit, its height in metres is given by

$$h(t) = -5t^2 + 20t + 0.8$$

Determine the following:

(a) How high was the ball above the ground when it was hit?

[1]

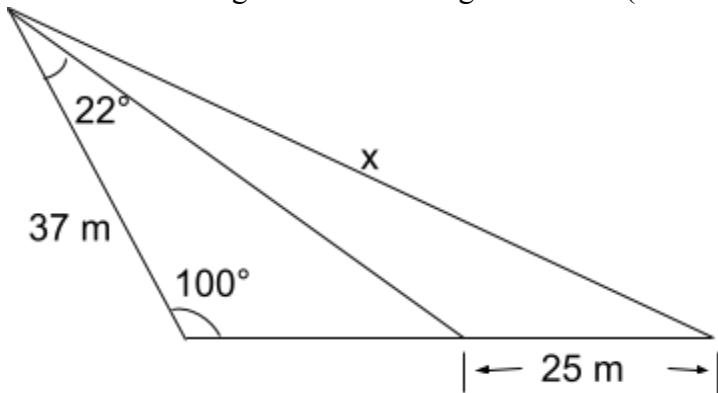
(b) What is the maximum height of the ball?

[3]

(c) When will the ball hit the ground?

[3]

5. Determine the length of x in the diagram below. (answer to one decimal place.)



[5]

6. For $\cos(A) = -\frac{2}{3}$, where $0^\circ \leq A \leq 360^\circ$,
- sketch the possible positions of the terminal arms for angle A on the cartesian plane,
 - determine the exact values of $\tan(A)$, and
 - determine the related acute angle and all values for A to 1 decimal place.

[5]

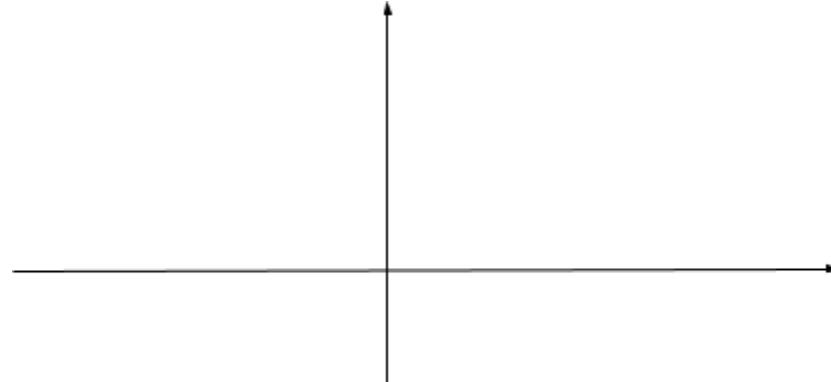
7. (a) State the pointwise formula for the transformation from the parent function in 4(b) to $y = 2 \times 3^{-2(x+1)} - 3$ and use it with at least 3 key points.

[3]

(x, y) ----->

- (b) Graph and label the function $y = 2 \times 3^{-2(x+1)} - 3$. (Identify at least 2 key points and the asymptote on the graph.)

[3]



8. (a) State the pointwise formula for the transformation from $y = \cos(x)$ to $y = -3 \cos(10(x + 9)) + 2$, and use it with at least 3 key points of $y = \cos(x)$.

[3]

(x, y) ----->

- (b) Sketch one period of $y = -3 \cos(10(x + 9)) + 2$.
Include a scale and label all important points and the axis.

[3]

