SIT190 - SQUIRE - WEEK 4-6 - ONTRACK ASSESSMENT

TRIMESTER 1, 2024

1. Quadratics

(1) For each of the following equations, state the number of real solutions to the equation and use the discriminant to support your answer.
   (a) $-x^2 - 3x - 10 = 0$
   (b) $5x^2 - 150 = 0$
   (c) $25x^2 - 20x + 4 = 0$
(2) For the following quadratics, complete the square and so identify the stationary point in the parabola.
   (a) $y = x^2 - 6x + 17$
   (b) $y = 3x^2 - 12x + 6$
(3) Find the solutions for $4x^2 - 3x = 10$.

Task 2: Logarithms and Exponentials

(1) Solve each of the following equations for x using the rules for logs and exponentials.
   (a) $2y = 10 + e^{3x-4}$
   (b) $\ln(2x - 3) + \ln(x - 2) = \ln(9x - 24)$
(2) Expand and simplify: $(2e^{2x} - e^{-2x})^2$
   Check your answer by substituting $x = 0$ into this expression and into your answer. Are they the same?
(3) Simplify the following expression: $2\ln(xy) + \ln(x) - \ln(x^3y^2)$. Show all working and apply log rules at each step.

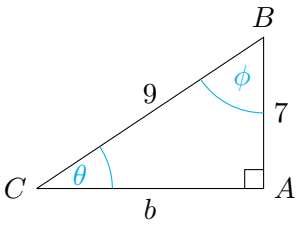

FIGURE 1. Triangle

TASK 3: TRIGONOMETRY

(1) Find the length of side a and the missing angles θ and ϕ (degrees) in the triangle in Figure 1. Show all working - give the exact answer and a rounded answer in radians to 4 decimal places.

(2) If $\cos(\theta) = \frac{-\sqrt{3}}{2}$ and $\sin(\theta) = \frac{-1}{2}$, which quadrant does the angle θ belong to? Explain your answer in at most 2 sentences.

(3) Sketch the function $y = 2\cos(x)$ for $x \in [0, 2\pi]$. State the range of the function and $x-$ and y-intercepts.

SUBMISSION

To successfully complete this assessment, you must submit:

Task 1: Quadratics:

- **1.1(a-c):** For each equation, give the number of solutions with a short sentence using the discriminant supporting your answer. (Include all working used to find the discriminant.)
- **1.2(a-b):** For each function express in 'completing the square format' showing all working and give the stationary point. of the function showing how you obtained the answer from the 'completing the square' format.
- **1.3:** The values for x showing all working.

Task 2: Logarithms and Exponentials:

- **2.1(a-b):** The solutions for x in each of the equations showing all working.
- **2.2:** The expanded and simplified expression showing all working. The evaluation when $x = 0$ of the initial expression and the final expression.
- **2.3:** The simplified expression showing all working.

Task3: Trigonometry:

3.1: The length of the side and the angles in radians of the triangle including all working and/or explanation.

3.2: Give the quadrant that the angle θ belongs to, and a brief explanation why.

3.3: Sketch of the graph of the function showing the intercepts and giving the range of the function. Provide working for finding the intercepts.

Useful resources

- Watch, Read and Think Section 4 including 4.2 Determining the number of solutions: the discriminant and 4.3 Completing the square
- Video: Completing the square
- Treasure chest: Completing the square
- Completing the square gives the quadratic in the form $a(x-h)^2+k$ where a, h and k are real numbers. The stationary point of a quadratic, also known as the turning point, occurs when $x = h$.
- Watch, Read and Think Section5 including 5.5 Solving equations involving exponential and logarithmic functions.
- Treasure Chests ('Rules for exponentials' and 'Logarithms')
- Watch, Read and Think Section 6 including 6.3 Graphs of trigonometric functions and 6.4 Solving trigonometric problems.
- Videos - Special Triangles, Graphs of Trigonometric Functions, and Solving Trigonometric Problems.
- Treasure Chess - finding the missing side of a triangle, finding the missing angle of a triangle.
- Formula Sheet