Math SL PROBLEM SET 5

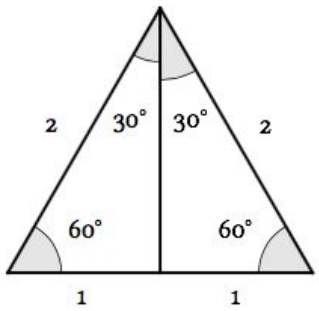
1. (**F2.4 - R**) **(CI)** Given the quadratic function $f(x) = 4x^2 - 4x - 15$. *(Cirrito 2.4.2, p44)*

   a. Find the zeroes of this function.

   b. Find the optimal point of this function.

   c. Is this optimal point a maximum or minimum? Show/explain your reasoning.

2. (**T3.2 - R**) **(CI)** By considering an equilateral triangle with side length 2, find in exact form the values of sin 30, cos 30, tan 30, sin 60, cos 60, tan 60. *(Cirrito 10.1.1, p315)*



3. (**T3.4, T3.5 - R**) **(CI)** Given the function $g(\theta) = 2\sin(\theta) - 1$ on the domain of $0° \leq \theta \leq 360°$, *(Cirrito 10.4.1, p351)*

   a. Find the zeroes of this function. (HINT: special triangles?)

   b. Determine the range of this function.

4. (**F2.1, F2.4, F2.7 - R**) **(CI)** Given the quadratic function $Q(x) = 3(x - 1)^2 + 5$; *(Cirrito 2.4.1, p39; Cirrito 2.4.2, p44)*

   a. Determine the equation of the inverse function.

   b. Write the equation for $Q(x)$ in standard form.

   c. Given your work in Q(b), find the value of the discriminant of $Q(x)$.

   d. Explain the graphical significance of the **sign of your discriminant**.

   e. The graphical significance you just noted about the sign of the discriminant of $Q(x)$ could have been determined from **the original function as presented** (as $Q(x)$). Explain how you could have made the same conclusion from the form .

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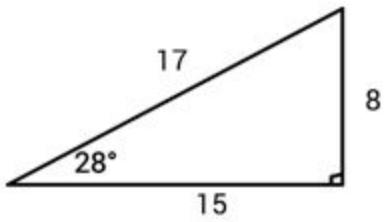
5. (**T3.2, T3.4 - R**) **(CI)** You are given this special right triangle as well as the measure of one of its angles. Use this diagram to answer the following questions. ***(Cirrito 10.1.2, p316)***



   a. Evaluate the following: (i) $\cos(28°)$; (ii) $\tan^{-1}\left(\frac{15}{8}\right)$

   b. Use this special triangle and your knowledge of angles in standard position to evaluate $\sin(332°)$.

   c. The terminal arm of the angle goes through the point A(-8, -15) . Draw the angle and label the principal angle and the related acute angle.

   d. Explain WHY Sara knows that the measure of the principal angle in Q(c) is 242°.

6. **(F2.4 - R) (CA)** The rising junior class at CAC has decided to design, build and run a for-profit playground on a field they will rent from Victory College First of all, the jungle gym needs a sandbox to go into. Based on the preliminary drawings the box was a square, but it was much too small. President Sufi told the designers that the sandbox needed to be twice as wide and the length needed to be increased by 7 meters. **(Cirrito 2.4.2, p44)**

   a. Write an equation for the area of the new sandbox, assuming the original sandbox had side length of x meters.

   b. The total area of the sandbox needs to be 36 square meters. Given that, determine the dimensions of the sandbox.

   c. Good sand costs 600LE per cubic meter. If the sand budget is 10,000LE, and the sand is spread evenly over the entire sandbox, then how deep should the box be to contain all of the sand?

7. **(F2.8 - R) (CA)** Secretary Abdel Hafez, proposes a rollercoaster for this playground. Ali's team determined the equation of this model to be $g(x) = -0.04x^4 + 0.76x^3 - 4.6x^2 + 9x + 1$.

   a. Determine the maximum and minimum points of this graph.

   b. On what intervals is the rollercoaster increasing?

   c. What is the maximum height reached by the roller coaster?

   d. What is a reasonable domain for this model. Explain/Justify you answer.