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by parmenides51

- 1 Show that if we take any six numbers from the following array, one from each row and column, then the product is always the same:

4 6 10 14 22 26  
6 9 15 21 33 39  
10 15 25 35 55 65  
16 24 40 56 88 104  
18 27 45 63 99 117  
20 30 50 70 110 130

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- 2 Show that  $\sqrt[3]{\sqrt{52} + 5} - \sqrt[3]{\sqrt{52} - 5}$  is rational.

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- 3 Show that if  $b = \frac{a+c}{2}$  in the triangle  $ABC$ , then  $\cos(A - C) + 4 \cos B = 3$ .

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- 4  $ABC$  is a triangle. A circle through  $A$  touches the side  $BC$  at  $D$  and intersects the sides  $AB$  and  $AC$  again at  $E, F$  respectively.  $EF$  bisects  $\angle AFD$  and  $\angle ADC = 80^\circ$ . Find  $\angle ABC$ .

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- 5 Find all polynomials  $p(x)$  such that  $p'(x)^2 = cp(x)p''(x)$  for some constant  $c$ .

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- 6 A chessboard is covered with 32 dominos. Each domino covers two adjacent squares. Show that the number of horizontal dominos with a white square on the left equals the number with a white square on the right.
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