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1. An enterprising calculus student determines that for a particularly interesting (it is, after all, on a quiz) function  $g(x)$ ,  $\int_1^5 g(x) dx = 3$ ,  $g(1) = 1$ , and  $g(5) = 2$ . If possible, find  $\int_1^5 x g(x^2 + 4) dx$  (if it isn't possible, explain why). (3 points)

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2. For the same tremendously interesting function  $g(x)$  given in problem (1), find, if possible,  $\int_1^5 x g'(x) dx$  (if it isn't possible, explain why). (3 points)

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3. Let the function  $f(x) = \int_0^{\cos(x)} \sin(t^2) dt + 2$ . What is the slope of the tangent line to  $f(x)$  at  $x = \frac{\pi}{4}$ ? Find an estimate for the value of  $f(\frac{\pi}{4})$  and use this to write an equation for the tangent line. (4 points)