



Quiz # 03  
Math 101 Section 03 Calculus I  
16 October 2024 Wednesday  
Instructor: Ali Sinan Sertöz  
**Solution Key**

Bilkent University

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**Q-1)** We have the following functions:

- $f(x) = 3x^3 + 5x^2 + 7x + 11$
- $g(x) = (x^3 - 2)^7 + 1$
- $h(x) = (x^2 - 4)^5 + 2 \cos \frac{\pi x}{4} + \sin \frac{\pi x}{4}$ .

Find the value of  $(f \circ g \circ h)'(2)$ .

Grading: 10 points

**Solution:** Grader: `gunes.akbas@bilkent.edu.tr`

We first note that we have  $h(2) = 1$ ,  $g(1) = 0$  so we must calculate

$$(f \circ g \circ h)'(2) = f'(0) g'(1) h'(2).$$

Now the following calculations are self explanatory:

$$h'(x) = 10x(x^2 - 4)^4 - \frac{\pi}{2} \sin \frac{\pi x}{4} + \frac{\pi}{4} \cos \frac{\pi x}{4}.$$

$$h'(2) = -\frac{\pi}{2}.$$

$$g'(x) = 21x^2(x^3 - 2)^6$$

$$g'(1) = 21.$$

$$f'(x) = 9x^2 + 10x + 7,$$

$$f'(0) = 7.$$

We now finally have:

$$(f \circ g \circ h)'(2) = f'(0) g'(1) h'(2) = (7)(21) \left(-\frac{\pi}{2}\right) = -\frac{147}{2} \pi.$$