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/m160.fa07/handouts160/q910/q910_160

These are alleged answers. For each error herein, you get extra-credit points for being the first to report it by e-mail.

- 1 MATH 160 expects you to know the difference-quotient formula:

$$DQ = \frac{f(x+h) - f(x)}{h}$$

For the difference quotient for $f(x) = 2 - 3x - 4x^2$, we first do $f(x+h)$:

$$\begin{aligned} f(x+h) &= 2 - 3(x+h) - 4(x+h)^2 \\ &= 2 - 3x - 3h - 4(x^2 + 2hx + h^2) \\ &= 2 - 3x - 3h - 4x^2 - 8hx - 4h^2. \end{aligned}$$

And then, for the difference-quotient numerator:

$$\begin{aligned} f(x+h) - f(x) &= (2 - 3x - 3h - 4x^2 - 8hx - 4h^2) - (2 - 3x - 4x^2) \\ &= 2 - 3x - 3h - 4x^2 - 8hx - 4h^2 - 2 + 3x + 4x^2 \\ &= -3h - 8hx - 4h^2 = h(-3 - 8x - 4h). \end{aligned}$$

So that we wind up with

$$DQ = \frac{f(x+h) - f(x)}{h} = \frac{h(-3 - 8x - 4h)}{h} = -3 - 8x - 4h$$

- 2 Now for the limit:

$$\lim_{h \rightarrow 0} DQ = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} (-3 - 8x - 4h) = -3 - 8x$$