1 *Let f be the function such that*

$$f(x) = 3x^2 + 2x - 4$$

for every possible real number x. Evaluate or simplify the following. (Show at least one intermediate step for each.)

a $f(1)$

I replace x with -1 (in parentheses) and evaluate:

$$\begin{aligned} f(x) &= 3x^2 + 2x - 4; \\ f(-1) &= 3(-1)^2 + 2(-1) - 4 = -3. \end{aligned}$$

b $f(2x)$

I replace x with $2x$ (in parentheses) and simplify:

$$\begin{aligned} f(x) &= 3x^2 + 2x - 4; \\ f(2x) &= 3(2x)^2 + 2(2x) - 4 = 12x^2 + 4x - 4. \end{aligned}$$

2 Extra credit. *Let g be the function such that*

$$g(x) = \frac{x}{x^2 - 16}$$

for every possible real number x. What is the domain of g? (Show at least one intermediate step.)

I can't divide by zero, so

$$\begin{aligned} x^2 - 16 &\neq 0, \\ x^2 &\neq 16, \\ x &\neq \pm 4. \end{aligned}$$

Therefore, the domain is

$$\{x \mid x \neq 4,\ x \neq -4\} = (-\infty, -4) \cup (-4, 4) \cup (4, \infty).$$

3 *Given*

$$\begin{aligned} f(x) &= 3x + 4, \\ g(x) &= 2x - 3, \end{aligned}$$

what is $(f + g)(x)$?

When you add functions, you add their inputs:

$$(f + g)(x) = f(x) + g(x) = (3x + 4) + (2x - 3) = 5x + 1.$$