

## Quiz 1 Solutions

1. Compute

$$\lim_{x \rightarrow \infty} \frac{3x^2 + 5}{2x^2 + 1}.$$

**Solution:**

$$\begin{aligned} \lim_{x \rightarrow \infty} \frac{3x^2 + 5}{2x^2 + 1} &= \lim_{x \rightarrow \infty} \frac{3 + \frac{5}{x^2}}{2 + \frac{1}{x^2}} \\ &= \frac{3 + 0}{2 + 0} = \frac{3}{2}. \end{aligned}$$

Alternatively, you can use L'Hôpital's rule twice.

2. Compute the derivative of

$$f(x) = \frac{\sin(3x)}{x}.$$

**Solution:** Quotient rule:

$$f'(x) = \frac{3 \cos(3x)x - \sin(3x)}{x^2}.$$

3. Compute

$$\int_0^3 x^2 - 1 + \cos(2\pi x) \, dx.$$

You should simplify your final answer as much as possible.

**Solution:**

$$\begin{aligned} \int_0^3 x^2 - 1 + \cos(2\pi x) \, dx &= \left( \frac{x^3}{3} - x + \frac{\sin(2\pi x)}{2\pi} \right) \Big|_0^3 \\ &= \frac{3^3}{3} - 3 + 0 - (0 - 0 + 0) = 6. \end{aligned}$$