

1. For the following, let  $f(x) = x^2 + 3x + 2$ .

- (a) Calculate  $f'(0)$ .
- (b) Write the function  $g(x)$  obtained by translating  $f(x)$  to the left by 2 units.
- (c) Calculate  $g'(0)$  (hint:  $g(x) = f(x + 2)$  so you will want to expand and recollect terms to put the polynomial in the usual nice form). Since translation doesn't change slopes, this should be the same as  $f'(2)$  (to be defined later).

2. Calculate  $f'(0)$  for the following functions:

- (a)  $1 + 2x + 3x^2 + 4x^3 + 5x^4 + \dots$
- (b)  $x + 2x^2 + x^3 + 2x^4 + x^5 + \dots$
- (c)  $1 + x^4 + x^8 + \dots$
- (d)  $|x^2 + x - 12|$
- (e)  $|x + 4|$
- (f)  $|x^2 + x + 3|$

3. For each of the following functions, express them in the form

$$f(x) = f(0) + f'(0)x + \text{error}(x)$$

- (a)  $(x - 1)^2 + 3x + 2$
- (b)  $x^{100} - x^{50}$
- (c)  $x^3 + 4x\sqrt{x} - x + 1$
- (d)  $x^4 - 3x$