

1. Find the derivative, f' of the function f .

(a) $f(x) = (2x + 3)(5x^2 - 1)$

$$f'(x) = 2(5x^2 - 1) + 10x(2x + 3).$$

(b) $f(x) = (x^3 - 8x)(1 - x + 2x^3)$

$$f'(x) = (3x^2 - 8)(1 - x + 2x^3) + (-1 + 6x^2)(x^3 - 8x).$$

(c) $f(x) = (1 - 3x^2)\left(1 - \frac{1}{x^2}\right) = (1 - 3x^2)(1 - x^{-2})$

Now $f'(x) = -6x \cdot (1 - x^{-2}) + -(-2)x^{-3}(1 - 3x^2)$
 (or $-6x\left(1 - \frac{1}{x^2}\right) + \frac{2}{x^3}(1 - 3x^2)$)

(d) $f(x) = \frac{3x - 2}{2x + 3}$

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

(e) $f(x) = \frac{\sqrt{x} - 1}{x + 1} = \frac{x^{\frac{1}{2}} - 1}{x + 1}$

Now $f'(x) = \frac{\frac{1}{2}x^{\frac{1}{2}-1}(x+1) - 1(x^{\frac{1}{2}} - 1)}{(x+1)^2}$ (or $\frac{\frac{1}{2\sqrt{x}}(x+1) - (\sqrt{x} - 1)}{(x+1)^2}$)

(f) $f(r) = \frac{3r^2 - 7r}{2r - 5}$

$$f'(r) = \frac{(6r - 7)(2r - 5) - 2(3r^2 - 7r)}{(2r - 5)^2}.$$