BAE Math 1 Exercises

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Exercise 1. Compute the derivative of each of the following functions:

$$f(x) = x^6 - 3x^4 + 2x + 11;$$

$$f(x) = x\sin(x) + x^3 e^x;$$

$$f(x) = \sqrt{x} + \sqrt[3]{x} + \frac{1}{x} - \frac{1}{x^2};$$

$$f(x) = \sqrt{x+3}\, e^x - x^2 \log(5x+1)$$

$$f(x) = 3\log(x) - 6e^x + \pi\sin(x)$$

$$f(x) = \frac{x^2 - 3x + 1}{x+2};$$

$$f(x) = \sqrt{x^2+1} + \log(2x);$$

$$f(x) = \frac{\sin x}{e^x + 1};$$

$$f(x) = \sqrt{e^{x^2+3x+3}};$$

$$f(x) = \log\left(\frac{x^2 - 5x + 6}{3 - x}\right);$$

$$f(x) = \sin(x^2) + \cos^2(x);$$

$$f(x) = \sqrt{\frac{5x+3}{2x+7}};$$

$$f(x) = \cos^2(e^{x^3+3x^2});$$

$$f(x) = \frac{|x-1|}{4};$$

Exercise 2. Find all the critical points of the following functions and describe what kind of points they are:

$a)$ $f(x) = 4x^3 - 12x + 9;$

$b)$ $f(x) = xe^{3x};$

$c)$ $f(x) = \dfrac{x^3 - 3x^2}{x+1};$

$d)$ $f(x) = \log\left(\dfrac{x^2+1}{x^2+x+2}\right);$

$e)$ $f(x) = \log(\cos^2(x) + 2);$

$f)$ $f(x) = \sqrt{\dfrac{x+8}{x^2+6x}};$

Exercise 3. Study the following functions and sketch a graph of them:

$a)$ $f(x) = \dfrac{x^2-1}{x+3};$

$b)$ $f(x) = \dfrac{x+1}{e^x};$

$c)$ $f(x) = \log\left(\dfrac{x^2}{x-1}\right);$

$d)$ $f(x) = x - \sqrt{x-1};$