CK0030: Partial evaluation I

Exercise 01 (50%).

Implement a Python (2.x or 3.x) code that computes the following function when $x = 0.5$

$$f(x) = \frac{e^{-1/x} + x^2 + \dfrac{1}{\log^2 x} + x \log\left(e^{-1/x} + e^{-2/x}\right) + 1}{e^x - 1}.$$

Comment your implementation and justify/motivate your answer.

Solution:

$$\underbrace{f(x)}_{\texttt{f1}} = \frac{\overbrace{\underbrace{e^{-1/x} + x^2 + \dfrac{1}{\log^2 x}}_{\texttt{f1\_num\_a}} + \underbrace{x \log\left(e^{-1/x} + e^{-2/x}\right) + 1}_{\texttt{f1\_num\_b}}}^{\texttt{f1\_num = f1\_num\_a + f1\_num\_b}}}{\underbrace{e^x - 1}_{\texttt{f1\_den}}}.$$

```
1  from math import exp, log
2
3  x1 = 0.5
4
5  f1_num_a = exp(-1./x1) + x1**2 + 1./log(x1)**2
6  f1_num_b = x1*log(exp(-1./x1) + exp(-2./x1) + 1
7  f1_num = f1_num_a + f1_num_b
8
9  f1_den = exp(x1) - 1
10
11 f1 = f1_num/f1_den
```

Exercise 02 (50%).

Implement a Python (2.x or 3.x) code that computes the following function when $x = 0.5$

$$f(x) = \frac{x\left[\cos(\sqrt{x^3}) - 1\right] + \sin^2(x^{3./4})}{x^3 e^{-1/\sqrt{x}} + \left(e^{x^2} - 1\right)/\sqrt{x}}.$$

Comment your implementation and justify/motivate your answer.

Solution:

$$\underbrace{f(x)}_{\texttt{f2}} = \frac{\overbrace{x\left[\cos(\sqrt{x^3}) - 1\right] + \sin^2(x^{3./4})}^{\texttt{f2\_num}}}{\underbrace{x^3 e^{-1/\sqrt{x}} + \left(e^{x^2} - 1\right)/\sqrt{x}}_{\texttt{f2\_den}}}.$$

```
1 from math import sin, cos, sqrt, exp
2
3 x2 = 0.5
4
5 f2_num = x2 * cos(sqrt(x2**3)) + sin(x2**(3./4))**2
6 f2_den = x2**3 * exp(-1./sqrt(x2)) + exp(x2**2)/sqrt(x2)
7
8 f2 = f2_num/f2_den
```