Exercises 5.1, Mathematics 1 (12-PHY-BIPMA1)
Artem Sapozhnikov

1. Compute the derivatives of the following functions (at the points where they exist):
   (a) $f(x) = \sin(\ln x)$,
   (b) $f(x) = \ln(1 + \sin x)$,
   (c) $f(x) = x^2 \sin(2x) + 2x \cos x \ln x$,
   (d) $f(x) = \arccos\left(\frac{1}{x}\right)$,
   (e) $f(x) = \ln(\tan \frac{x}{2}) - \frac{\cos x}{2 \sin^2 x}$,
   (f) $f(x) = x^x$,
   (g) $f(x) = (\sin x)^{\cos x} + (\cos x)^{\sin x}$,
   (h) $f(x) = \arctan\left(\frac{x+1}{x-1}\right)$.
2. Compute
   (a) $(\sin x + \cos x)^{(10)}$,
   (b) $(\sqrt{x})^{(8)}$,
   (c) $\left(\frac{\sqrt{1-x}}{\sqrt{1+x}}\right)^{(50)}$,
   (d) $(x^n e^x)^{(n)}$, for any $n \in \mathbb{N}$,
   (e) $\left(\frac{\ln x}{x}\right)^{(n)}$, for any $n \in \mathbb{N}$.