

Exercise. 1 Find the approximated value using total differential.

$$\text{a) } \sqrt{3 + \frac{1}{0.98}}, \quad \text{b) } \sqrt{5 + (2.01)^2}, \quad \text{c) } \ln(9 - (2.01)^3).$$

Exercise. 2 Find the equation of the tangent to the curve at x_0 .

$$\begin{array}{lll} \text{a) } y = x^2 - 4x + 5 & x_0 = 1 & \text{answer: } y = -2x + 4 \\ \text{b) } y = \arcsin\left(\frac{1-x}{3}\right) & x_0 = 1 & \text{answer: } y = -\frac{x}{3} + \frac{1}{3} \\ \text{c) } y = \frac{x-2}{x+3} & x_0 = -2 & \text{answer: } y = 5x + 6 \end{array}$$

Exercise. 3 Find extremes of the following functions and determine monotonicity.

$$\begin{array}{ll} \text{a) } y = \frac{x}{\ln x} & \text{answer: } y_{\min} = e \\ \text{b) } y = \frac{4x}{x^2+1} & \text{answer: } y_{\min} = -1, y_{\max} = 1 \\ \text{c) } y = x^2 e^{-x} & \text{answer: } y_{\min} = 0, y_{\max} = 2 \end{array}$$

Exercise. 4 Find the inflexion points of the following functions.

$$\begin{array}{ll} \text{a) } y = x^4 e^{-x} & \text{answer: } x = 2, x = 6 \\ \text{b) } y = x\sqrt{x-4} & \text{answer: } x = \frac{16}{3} \\ \text{c) } y = \ln(1+x^2) & \text{answer: } x = 1, x = -1 \end{array}$$

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