

2. exercise sheet for Engineering Mathematics

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(first name)	(last name)
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(student id number)	

2.1. (Differentiation)

(4 credits)

Compute the following derivatives:

(a) $\frac{d}{dx} \frac{x}{x} =$,

(b) $\frac{d}{dx} \frac{x-2}{x^2+1} =$,

(c) $\frac{d}{dx} \exp(\cos(x)^2) =$,

(d) $\frac{d}{dx} \arcsin(x) =$.

(Hint: arcsin is the inverse function of the sine function restricted to $(-\frac{\pi}{2}, \frac{\pi}{2})$.)

2.2. (Integration)

(4 credits)

Compute the following integrals:

(a) $\int_1^2 \left(x + \frac{1}{x} + \frac{1}{x^2} \right) dx =$,

(b) $\int_0^{\sqrt{\pi}} x \cos(x^2) dx =$,

Please submit your solutions digitally at the corresponding TeachCenter course. The deadline is 18.10.2022, 23:55 o'clock. <https://tc.tugraz.at/main/course/view.php?id=4636>
<https://www.math.tugraz.at/~mtechnau/teaching/2022-w-engimaths.html>

(c) $\int_0^5 x^2 \exp(x) dx =$.

(Please give *exact* values, and not approximations. For instance, do *not* write 0.6931 for $\log(2)$.)

Hint: All of the above exercises can be solved using the fundamental theorem of calculus. For (c) one would usually use a trick called “integration by parts”. If you do not know this trick, try to find $A, B, C \in \mathbb{R}$ such that $\frac{d}{dx}((A+Bx+Cx^2)\exp(x)) = x^2 \exp(x)$ and then apply the fundamental theorem.