

Lecture 33: Worksheet

This worksheet as well as the solutions was generated by Sofia, a bot written in the academic year 2003/2004 using grant from the Harvard Provost together with Harvard students **Johnny Carlsson**, **Andrew Chi** and **Mark Lezama**. At that time, people have laughed at the chat bot idea. Now it is big business: Google, Siri, Cortana, Wolfram alpha: these are all AI bots which constantly become more and more sophisticated.

1 Differentiate the following functions:

- a) $f(x) = 4(x + \tan(x))$
- b) $f(x) = x^4 + x$
- c) $f(x) = 4(x + \log(x))$

2 Integrate the following functions:

- a) $f(x) = 3$
- b) $f(x) = -3 \sin(x)$
- c) $f(x) = 1 - e^x$

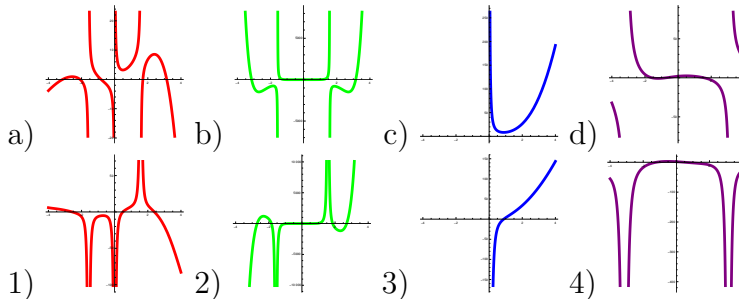
3 Differentiate the following functions:

- a) $f(x) = 0$
- b) $f(x) = \frac{3}{\sqrt{x}}$
- c) $f(x) = x \log(x) \sec(x)$

4 Integrate the following functions:

- a) $f(x) = 30x^4 \sqrt{x^5}$
- b) $f(x) = 3 \left(\frac{1}{x^2} + e^x + 1 \right)$
- c) $f(x) = -e^{-x}(x - 2)x$

5 Match the following functions with derivatives:



6 Find the critical points of the following functions:

- a) $f(x) = (x - 6)^2$
- b) $f(x) = (x - 8)(x - 7)$
- c) $f(x) = (x - 6)(x - 5)^2$