

Exercise sheet 3.4 and 3.5

(To do on your own. You can ask me if you have questions)

Exercise 1. Give the domain of differentiability of the following functions f and their derivatives. Give the equation of the tangent to f at point 1 (when possible).

$$f(x) = \frac{2x-7}{3x+4}$$

$$f(x) = x^{-4}$$

$$f(x) = 3x^{-3} + \frac{1}{2^x}$$

$$f(x) = (x^2 + 1)e^x + \cos(x)$$

$$f(x) = |x|e^{-x}$$

$$f(x) = x^2 \cos(x)$$

$$f(x) = \frac{\sin(x)}{\cos(x)}$$

$$f(x) = \tan(x)$$

$$f(x) = \frac{\sin(x)}{2}$$

$$f(x) = \frac{2}{\sin(x)}$$

Exercise 2. Give the n -th derivative of the following functions.

1. $f(x) = \sqrt{x}$ for $n = 2$

2. $f(x) = \sqrt{x}$ for $n = 3$

3. $f(x) = \cos(x)$ for $n = 2$

4. $f(x) = \sin(x)$ for $n = 2$

5. $f(x) = e^x$ for $n = 61$

6. $f(x) = x^2$ for $n = 2$

7. $f(x) = 3x^2 + 2x + 7$ for $n = 3$

8. $f(x) = 4x^3 + 16x^3 + 3x + 2$ for $n = 4$

9. $f(x) = 13x^4 + 26x^3 + 12x^2 - 2x - 1$ for $n = 5$

10. $f(x) = 722x^5 + 1243x^4 + 1209x^3 - 124x^2 - 61x + 1254$ for $n = 6$

Exercise 3. Let f be a polynomial of degree n ? What is the $(n + 1)$ th derivative of f ?