# MVE045 W3-RÖ1 (relevanta problem)

## kedjeregeln, implicit derivata

# ADAMS 2.1

In Exercises 1–12, find an equation of the straight line tangent to the given curve at the point indicated.

**1.** $y = 3x - 1$ at $(1, 2)$

**2.** $y = x/2$ at $(a, a/2)$

**3.** $y = 2x^2 - 5$ at $(2, 3)$

**4.** $y = 6 - x - x^2$ at $x = -2$

**5.** $y = x^3 + 8$ at $x = -2$

**6.** $y = \dfrac{1}{x^2 + 1}$ at $(0, 1)$

**20.** Find all points on the curve $y = x^3 - 3x$ where the tangent line is parallel to the $x$-axis.

**24.** For what value of the constant $k$ do the curves $y = kx^2$ and $y = k(x - 2)^2$ intersect at right angles? *Hint:* Where do the curves intersect? What are their slopes there?

# ADAMS 2.2

In Exercises 11–24, (a) calculate the derivative of the given function directly from the definition of derivative, and (b) express the result of (a) using differentials.

**11.** $y = x^2 - 3x$

**12.** $f(x) = 1 + 4x - 5x^2$

**13.** $f(x) = x^3$

**14.** $s = \dfrac{1}{3 + 4t}$

Calculate the derivatives of the functions in Exercises 34–39 using the General Power Rule. Where is each derivative valid?

**34.** $f(x) = x^{-17}$

**35.** $g(t) = t^{22}$

**36.** $y = x^{1/3}$

**37.** $y = x^{-1/3}$

# ADAMS 2.4 kedjeregel med polynomer och rationella funktioner

**THEOREM 6**

**The Chain Rule**

If $f(u)$ is differentiable at $u = g(x)$, and $g(x)$ is differentiable at $x$, then the composite function $f \circ g(x) = f(g(x))$ is differentiable at $x$, and

$$(f \circ g)'(x) = f'(g(x))g'(x).$$

Find the derivatives of the functions in Exercises 1–16.

**1.** $y = (2x+3)^6$

**2.** $y = \left(1 - \dfrac{x}{3}\right)^{99}$

**3.** $f(x) = (4 - x^2)^{10}$

**4.** $y = \sqrt{1 - 3x^2}$

**5.** $F(t) = \left(2 + \dfrac{3}{t}\right)^{-10}$

**6.** $(1 + x^{2/3})^{3/2}$

**9.** $y = |1 - x^2|$

# ADAMS 2.8 medelvärdesatsen

**THEOREM 11**

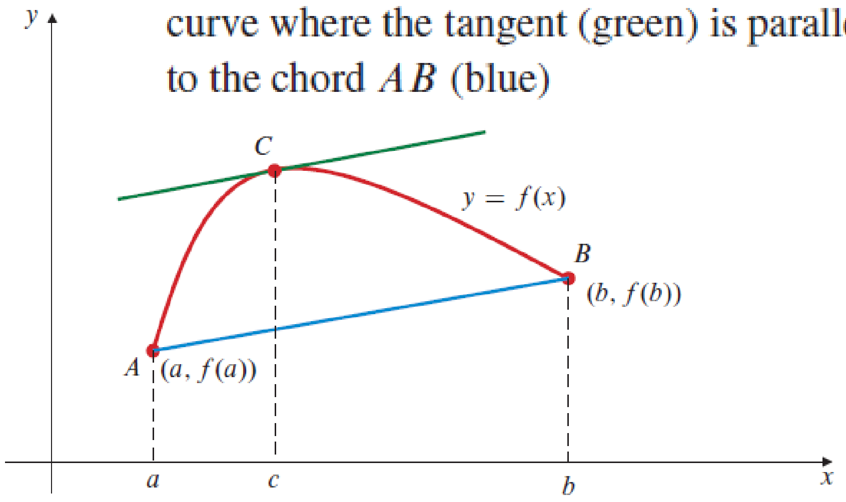
**The Mean-Value Theorem**

Suppose that the function $f$ is continuous on the closed, finite interval $[a, b]$ and that it is differentiable on the open interval $(a, b)$. Then there exists a point $c$ in the open interval $(a, b)$ such that

$$\frac{f(b) - f(a)}{b - a} = f'(c).$$

This says that the slope of the chord line joining the points $(a, f(a))$ and $(b, f(b))$ is equal to the slope of the tangent line to the curve $y = f(x)$ at the point $(c, f(c))$, so the two lines are parallel.

**Figure 2.28** There is a point $C$ on the curve where the tangent (green) is parallel to the chord $AB$ (blue)




In Exercises 1–3, illustrate the Mean-Value Theorem by finding any points in the open interval $(a, b)$ where the tangent line to $y = f(x)$ is parallel to the chord line joining $(a, f(a))$ and $(b, f(b))$.

**1.** $f(x) = x^2$ on $[a, b]$

**2.** $f(x) = \dfrac{1}{x}$ on $[1, 2]$

**3.** $f(x) = x^3 - 3x + 1$ on $[-2, 2]$