

Math 241 Homework 6 Solutions

Section 3.8

Problem 1. Find the linearization $L(x)$ of $f(x)$ at $x = a$: $f(x) = x^3 - 2x + 3$, $a = 2$

Solution

$$\begin{aligned}f(2) &= 8 - 4 + 3 = 7 \\f'(x) &= 3x^2 - 2 \Rightarrow f'(2) = 10\end{aligned}$$

Using the linearization formula we have

$$L(x) \approx 7 + 10(x - 2) = \boxed{10x - 13}$$

□

Problem 3. Find the linearization $L(x)$ of $f(x)$ at $x = a$: $f(x) = x + \frac{1}{x}$, $a = 1$

Solution

$$\begin{aligned}f(1) &= 1 + 1 = 2 \\f'(x) &= 1 - \frac{1}{x^2} \Rightarrow f'(1) = 1 - 1 = 0\end{aligned}$$

Using the linearization formula we have

$$L(x) \approx 2 + 0 = \boxed{2}$$

□

Problem 5. Find the linearization $L(x)$ of $f(x)$ at $x = a$: $f(x) = \tan x$, $a = \pi$

Solution

$$\begin{aligned}f(\pi) &= \tan \pi = 0 \\f'(x) &= \sec^2 x \Rightarrow f'(\pi) = \sec^2 \pi = 1\end{aligned}$$

Using the linearization formula we have

$$L(x) \approx 0 + (x - \pi) = \boxed{x - \pi}$$

□

Problem 17. Find dy of $y = x^3 - 3\sqrt{x}$

Solution

$$\frac{dy}{dx} = 3x^2 - \frac{3}{2\sqrt{x}}$$

Thus

$$dy = \boxed{\left(3x^2 - \frac{3}{2\sqrt{x}}\right) dx}$$

□