

- Routine problems:

§3.1. # 7, 9, 18, 25, 30, 59.

§3.2. # 27, 30, 54, 59.

§3.3. # 43, 46, 49, 61, 62.

§3.4. # 2.

§3.5. # 17, 23, 35, 39, 42, 47, 50, 57, 60, 61, 64.

§3.6. # 5, 7, 9, 27, 29.

§3.7. # 4, 6, 11, 19, 42, 55.

§4.1. # 13, 14, 20, 23, 24, 42.

- To hand in:

- (1) Suppose that f and g are twice differentiable. Compute

$$\frac{d}{dx} \left\{ f \left(\frac{3}{x} \right) \frac{d}{dx} g(x^4 - 5x) \right\}$$

- (2) Define the function f by

$$f(x) = \begin{cases} x^2 \sin \left(\frac{1}{x} \right), & \text{if } x \neq 0; \\ 0, & \text{if } x = 0. \end{cases}$$

- (a) Compute $f'(x)$ for $x \neq 0$.
(b) Show directly from the definition of the derivative that $f'(0)$ exists and is 0.
(c) Show that f' is discontinuous at $x = 0$.
- (3) Let f be a function that is differentiable for all $x \geq 0$. Suppose that $f'(x)$ satisfies the condition

$$a \leq f'(x) \leq b \text{ for all } x > 0.$$

Show that for all $x > 0$,

$$f(0) + ax \leq f(x) \leq f(0) + bx.$$