ex.1 For the following functions,
(a) find the intervals of increase or decrease and,
(b) find the local maximum and minimum values.

(i)
\[ f(x) = x + \cos x, [-2\pi, 2\pi] \]

(ii)
\[ f(t) = t\sqrt{t} + 3 \]

(iii)
\[ f(x) = \begin{cases} x, & x \text{ is rational} \\ 0, & x \text{ is irrational} \end{cases} \]

over the interval \([0, 1]\).

ex.2. Let \( f(x) = |x - 1| \).

(i) Does \( f \) satisfy the hypothesis of the Mean value Theorem on \([-1,0]\) ?

(ii) Show that there is no \( c \) such that \( f(3) - f(0) = f'(c)(3 - 0) \). Why does this not contradict the Mean value theorem?

ex.3. Show that \( \tan t > t \) for \( 0 < t < \frac{\pi}{2} \).

ex.4 Find a positive real number such that the sum of the number and its reciprocal is as small as possible.

ex.5. Solve the following problems from Chapter 11.
(i) 18 (Ecological Ed must cross a circular lake of radius 1 mile...)

(ii) 23(a) (Suppose that the critical points of the polynomial function ...Sketch the graph of \( f \) as accurately as possible....)

(iii) 33 (A cannon ball is shot from the ground with velocity \( v \)...
(iv) 34(a) (Given an example of a function \( f \) for which \( \lim_{x \to \infty} f(x) \) exists, but \( \lim_{x \to \infty} f'(x) \) not exist.)

(v) 52(ii) (Find
\[
\lim_{x \to 0} \frac{\cos^2 x - 1}{x^2}
\]
)

ex.6. Solve the following problems from Chapter 12.

(i) 6 (Show that \( f(x) = \frac{ax+b}{cx+d} \) is one-one ...)

(ii) 7(ii) (on which intervals \([a, b]\) will the function \( f(x) = x^5 + x \) be one-one ?)

(iii) 4 (If \( f \) and \( g \) are increasing, is \( f + g \)? Or \( f.g \)? or \( f \circ g \)?)