[Maximum and Minimum Values]

(1) Find the absolute maximum and absolute minimum values of $f$ on the given interval.

(a) $f(x) = 10 + 4x - x^2$, $[0, 5]$

(b) $f(x) = (x^2 - 4)^3$, $[-1, 3]$
(c) \( f(x) = 2 \cos x + \sin 2x, \quad [0, \pi/2]\)

(d) \( f(x) = xe^{x/2}, \quad [-3, 1] \)
(2) Find the number \( c \) that satisfies the conclusion of the Mean Value Theorem on the given interval.

(a) \( f(x) = 2x^2 - 3x + 1, \quad [0, 2] \)

(b) \( f(x) = \ln x, \quad [1, 4] \)
[How Derivatives Affect the Shape of a Graph]

(3) The graph of the derivative $f'$ of a function $f$ is shown.

(a) On what intervals is $f$ increasing or decreasing?

(b) At what values of $x$ does $f$ have a local maximum or minimum?

(c) On what interval is $f$ concave upward or downward?

(d) State the $x$-coordinates of the points of inflection.

(e) Sketch a graph of $f$. 
(4) Sketch a curve satisfying the following conditions.
(a) The domain of $f(x)$ is all real numbers.
(b) $f(2) = -2$, $f(0) = 0$, $f(4) = 2$, $f'(2) = 0$.
(c) $f'(x) < 0$ if $0 < x < 2$, $f'(x) > 0$ if $x > 2$.
(d) $f''(x) < 0$ if $0 \leq x < 1$ or if $x > 4$.
(e) $f''(x) > 0$ if $1 < x < 4$.
(f) $\lim_{x \to \infty} f(x) = 2$.
(g) The graph of $f(x)$ is symmetric about the $y$-axis.
(5) Sketch the graph of $f(x) = x^5 - 5x$ by locating intervals of increase/decrease, local extrema, concavity, and inflection points.
(6) Sketch the graph of \( f(x) = \frac{x}{x^2 - 4} \) by locating intervals of increase/decrease, local extrema, concavity, and inflection points.
(7) Find the limit.

(a) \( \lim_{x \to -2} \frac{x^3 + 8}{x + 2} \)

(b) \( \lim_{x \to \pi/2} \frac{1 - \sin x}{1 + \cos 2x} \)
(c) \[ \lim_{x \to 0} \frac{e^x - 1 - x}{x^2} \]

(d) \[ \lim_{x \to \infty} x^3 e^{-x^2} \]
(e) \( \lim_{x \to 0^+} \left( \frac{1}{x} - \frac{1}{e^x - 1} \right) \)

(f) \( \lim_{x \to 1^+} x^{1/(1-x)} \)
(g) \( \lim_{x \to 0^+} (4x + 1)^{\cot x} \)