A) Find the critical numbers of (if any).
B) Find the open interval(s) on which the function is increasing or decreasing,
C) Apply the First Derivative Test to identify all relative extrema.

1a) $f(x) = x^2 - 4x$

1b) $f(x) = \dfrac{x^5 - 5x}{5}$

(a) $f(x) = x^2 - 4x$

$f'(x) = 2x - 4$

Critical number: $x = 2$

(b)

Test intervals:	$-\infty < x < 2$	$2 < x < \infty$
Sign of f':	$f' < 0$	$f' > 0$
Conclusion:	Decreasing	Increasing

Decreasing on: $(-\infty, 2)$

Increasing on: $(2, \infty)$

(c) Relative minimum: $(2, -4)$

1c) $f(x) = (x + 2)^{2/3}$

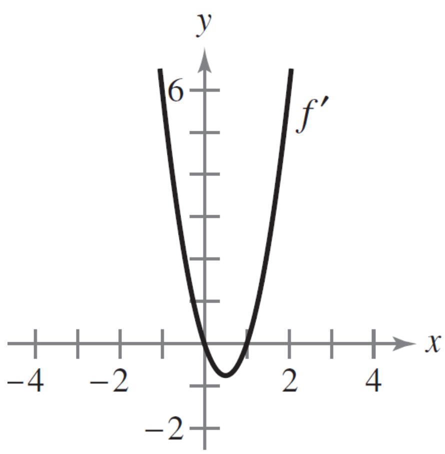
1d) $f(x) = \dfrac{x^2}{x^2 - 9}$

1e) $f(x) = (x - 1)^2(x + 3)$

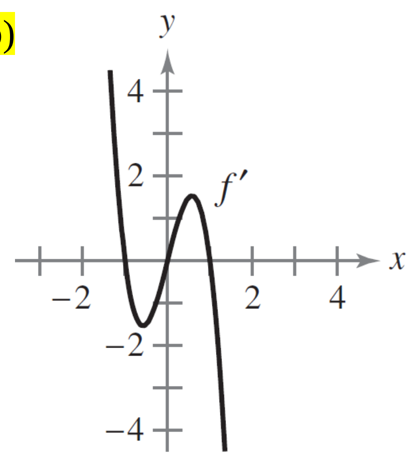
1f) $f(x) = \begin{cases} 4 - x^2, & x \le 0 \\ -2x, & x > 0 \end{cases}$ 1g) $f(x) = \dfrac{x}{2} + \cos x$ 1h) $f(x) = \sin^2 x + \sin x$, $[0, 2\pi)$

Use the graph of $f'(x)$ to (a) identify the interval(s) on which $f(x)$ is increasing or decreasing, and (b) estimate the value(s) of *x* at which $f(x)$ has a relative maximum or minimum.

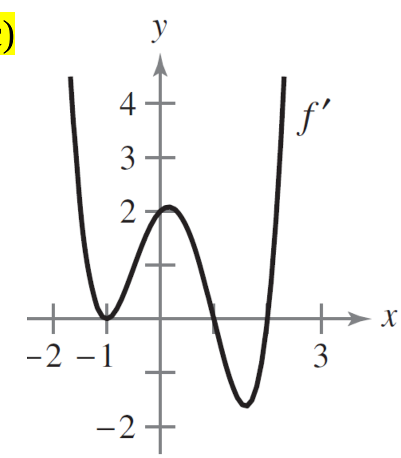
2a)



2b)



2c)



(a) Intervals of Increase $(-\infty, 0) \cup (1, \infty)$

Intervals of Decrease $(0, 1)$

(b) Relative maximum: $x = 0$
Relative minimum: $x = 1$