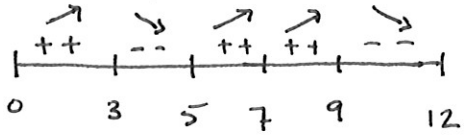
hw solutions
section 4.1

9. see graph p256
increasing: $(20.2, 20.6)$
$(21.7, 21.8)$
constant: $(19.6, 20.2)$
$(20.6, 21.1)$
decreasing: $(21.1, 21.7)$
$(21.8, 22.7)$

11. see graph p256
what is the sign of
(a) $f'(2)$ positive
(b) $f'(x)$ in $(1,3)$ positive
(c) $f'(4)$ 0
(d) $f'(x)$ in $(3,6)$ 0
(e) $f'(7)$ negative
(f) $f'(x)$ in $(6,9)$ neg
(g) $f'(x)$ in $(9,12)$ pos.

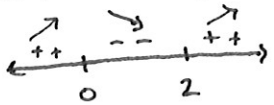
12. see graph p256
(a) What are the crit #s?
$x = 3, 5, 7, 9$
(maxs, mins, & inflect. pts)
$x = 0, 12$
(endpts)

(b) sign diagram



(c) rel extrema
rel. max: $x = 3 \to y = 3$
$x = 9 \to y = 6$
rel. min:
$(0,1)$, $(5,1)$, $(12,2)$

18. $f(x) = x^3 - 3x^2$
find where f is incr/decr.
$f'(x) = 3x^2 - 6x$
$0 = 3x^2 - 6x = 3x(x-2)$
crit #s: $x = 0, 2$

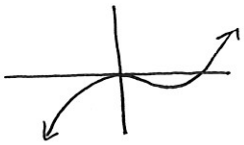


increasing: $(-\infty, 0) \cup (2, \infty)$
decreasing: $(0, 2)$

45.

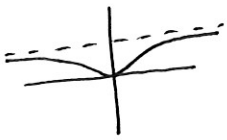
a.

46.



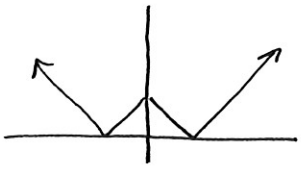
c.

47.

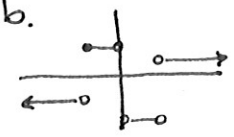


d.

48.



b.



60. $f(t) = 3t^5 - 20t^3 + 20$
find the rel. extrema
$f'(t) = 15t^4 - 60t^2$
$0 = 15t^2(t^2 - 4)$
$0 = 15t^2(t-2)(t+2)$
$t = 0 \Rightarrow F(0) = 20$
$t = 2 \Rightarrow F(2) = -44$
$t = -2 \Rightarrow F(-2) = 84$

94. If $f'(c) = 0$, then f has a rel. max/min at $x = c$.
false,
ex: $f(x) = x^3$ has no rel max/min
but $f'(0) = 0$