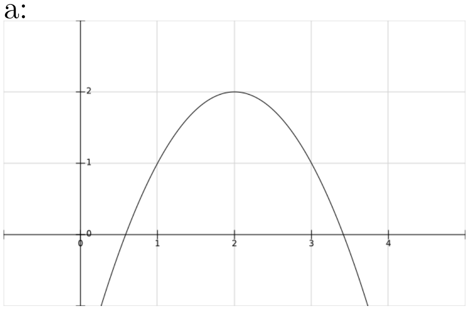
Chapter 4.2

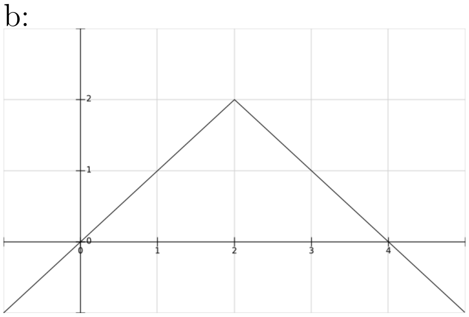
1:
An absolute minimum is a point at the lowest value that a graph reaches over an interval that, if the interval is open, does not include the limits of the interval. A relative minimum is any point that has a lesser value than the the points directly to the left or right of it.

5:
Local minima: (2, 2), (5, 3)
Local maxima: (4, 5)
Absolute minima: (0, 2), (2, 2)
Absolute maxima: (4, 5)

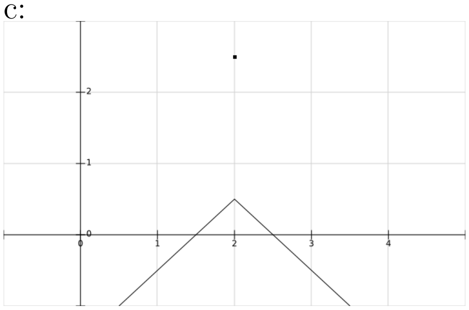
11:
a:



b:



c:



29:
Note: Used calculator (Ti-$n$spire CX CAS) to find x-intercepts of $f'(y)$
Critical numbers at $x = \{0, 2\}$

35:
Note: used calculator (Ti-$n$spire CX CAS) to find x-intercepts of $f'(\theta)$
Critical numbers at $\theta = \{2 \cdot n \cdot \pi, n \cdot \pi\}$

43:
Absolute maxima: $(-1, 8)$
Absolute minima: $(2, -18)$

51:
Absolute maxima: $(1, \ln(3))$
Absolute minima: $(1, \ln(1.75))$

59:
$f(x) = x \cdot \sqrt{x - x^2}$
a: No absolute min/max as function is consistantly concave down and on an open interval.
b: Likewise

61:
$V = 999.87 - 0.06426T - 0.0085043T^2 - 0.0000679T^3$
Max. density at $x = 208.614$

Chapter 4.3

2:
Concave upward: $(2, 4), (\frac{16}{3}, 8)$
Concave downward: $(0, 2), (4, \frac{16}{3})$

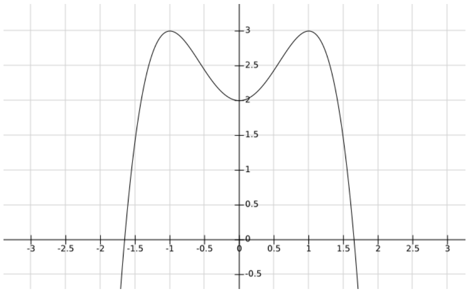
6:
a: $(2,4),(6,9)$ — if $f'(x)$ is positive, x is increasing.
b: $x=0,2,4,6$ — if $f'(x)=0$, $f(x)$ is at a local max or min
c: $(1,3),(5,7),(8,9)$ — if $f''(x)>0$, $f(x)$ is concave up, and vice versa
d: $x=1,3,5,7,8,9$ — inflection points are where $f''(x)$ changes from <0 to >0 or vice versa.

7:
a: Increase: $(-\infty,-3),(2,\infty)$
Decrease: $(-3,2)$
b: Local max: $x=-3$
Local min: $x=2$
c: Concave down: $(-\infty,0)$
Concave up: $(0,\infty)$

13:
a: Decreasing: $(-\infty,-\frac{\ln(2)}{3})$
Increasing: $(-\frac{\ln(2)}{3},\infty)$
b: Local min: $x=-\frac{\ln(2)}{3}$
c: Concave up: $(-\infty,\infty)$

20:
a: $x=0,\frac{4}{7},1$
b: Determines whether the points are a relative maximum or minimum or other.
$f''(0)=0$, meaning $f(0)$ is an inflection point
$f''(\frac{4}{7})>0$, meaning $f(\frac{4}{7})$ is a relative min
$f''(1)=0$, meaning $f(1)$ is an inflection point
c: Tells whether a point is a relative min, relative max, or inflection point by taking values from either side of the critical point

23:
a: Increase: $(-\infty,-1),(0,1)$
Decrease: $(-1,0),(1,\infty)$
b: Local max: $x=-1,1$
Local min: $x=0$
c: Concave down: $(-\infty,-\frac{\sqrt{3}}{3}),(\frac{\sqrt{3}}{3},\infty)$
Concave up: $(-\frac{\sqrt{3}}{3},\frac{\sqrt{3}}{3})$
d:



30:
a: Increase: $(0, \infty)$
Decrease: $(-\infty, 0)$
b: Local min: $x = 3 \cdot \ln(3)$
c: Concave down: $(-\infty, 3), (3, \infty)$
Concave up: $(3, 0), (0, 3)$
Inflection points: $x = 3 \cdot \ln(3)$

49:
Assuming I'm a standard well-tuned PD (Proportional-Derivitive) controller:
a: Turn down thermostat
b: Turn up a bit
c: Turn down a bit
d: Turn up