(SOLUTIONS)

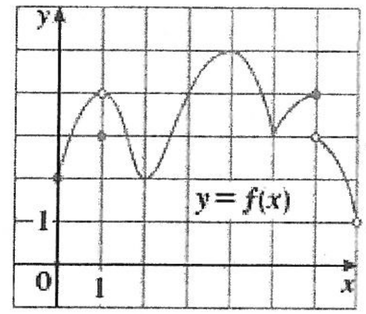
1. Use the graph to state the absolute and local maximum and minimum values of the function.

abs. max: $f(4) = 5$

no abs. min

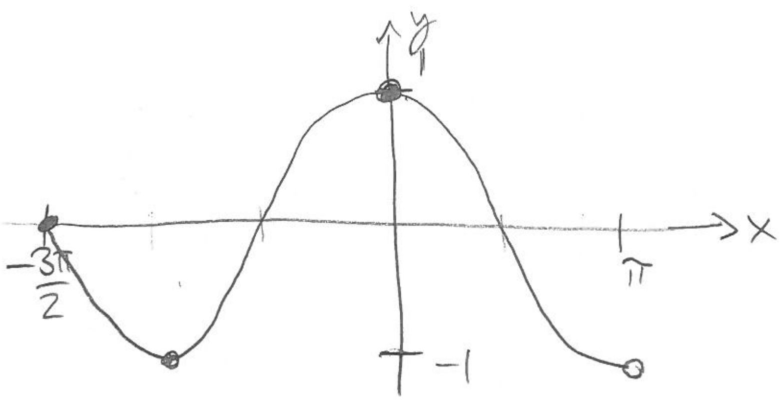
loc. min.: $f(1)=3$, $f(2)=2$, $f(5)=3$

loc. max.: $f(4)=5$, $f(6)=4$



2. Sketch the graph f by hand and use your sketch to find the absolute and local maximum and minimum values of f.

$$f(t) = \cos(t), \quad -\frac{3\pi}{2} \le t < \pi$$



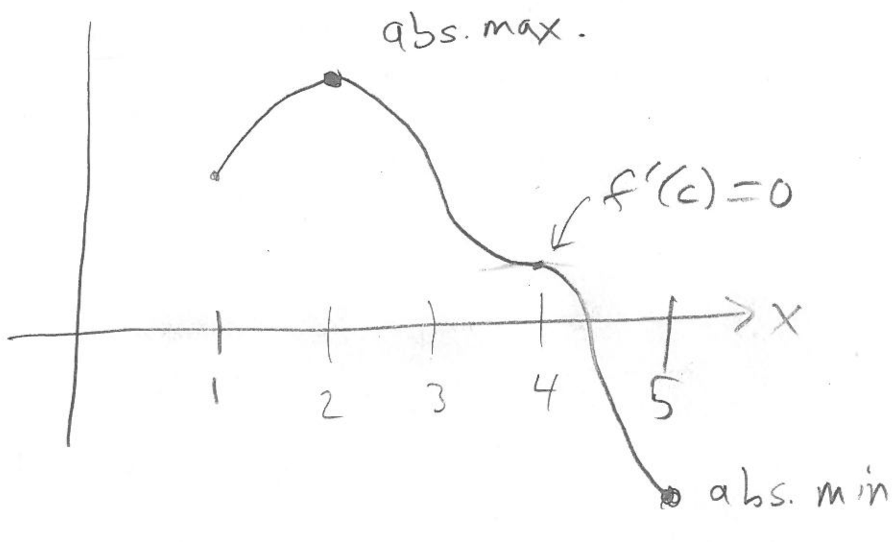
abs. max. $f(0)=1$

abs. min. $f(-\pi)=-1$

loc. max. $f(0)=1$

loc. min. $f(-\pi)=-1$

3. Sketch a graph of a function f which is continuous on $[1, 5]$, which has an absolute maximum at 2, has an absolute minimum at 5, and for which 4 is a critical number but neither a local maximum nor local minimum.



4. Find the absolute maximum and minimum values of f on the given interval:

$f(x) = 2x^3 - 3x^2 - 12x + 1, \qquad [-2, 3]$

$$f'(x) = 6x^2 - 6x - 12$$
$$= 6(x^2 - x - 2)$$
$$= 6(x-2)(x+1) = 0$$
$$x = 2, \ x = -1$$

x	$f(x)$	
-2	-3	
-1	8	abs. max.
2	$16 - 12 - 24 + 1 = -19$	abs. min.
3	-8	

5. Find the absolute maximum and minimum values of f on the given interval:

$f(x) = x^{-2} \ln x, \qquad [\frac{1}{2}, 4]$

$$f'(x) = -2x^{-3} \ln x + x^{-2} \cdot \frac{1}{x}$$
$$= \frac{-2\ln x}{x^3} + \frac{1}{x^3} = \frac{-2\ln x + 1}{x^3} = 0$$
$$-2\ln x + 1 = 0$$
$$\ln x = \frac{1}{2}$$
$$x = e^{1/2} \approx 1.5$$

x	$f(x)$	
$\frac{1}{2}$	$4 \cdot \ln(\frac{1}{2}) = -4\ln(\frac{1}{2})$	abs min.
$e^{1/2}$	$e^{-1} \cdot \frac{1}{2} = \frac{1}{2e}$	abs. max.
4	$\frac{\ln(4)}{16} = \frac{\ln(2)}{8}$	

6. Find the critical numbers of the function:

$h(p) = \dfrac{p-1}{p^2+4}$

$$h'(p) = \frac{1 \cdot (p^2+4) - (p-1)2p}{(p^2+4)^2} = \frac{p^2 + 4 - 2p^2 + 2p}{(p^2+4)^2} = 0$$

never 0

$$\Longleftrightarrow \quad -p^2 + 2p + 4 = 0$$
$$\Longleftrightarrow \quad p = \frac{-2 \pm \sqrt{4+16}}{-2} = \frac{-2 \pm 2\sqrt{5}}{-2} = 1 \pm \sqrt{5}$$

critical numbers are $c = 1+\sqrt{5}, \ 1-\sqrt{5}$