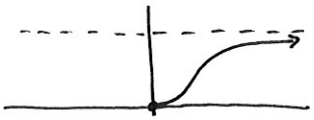
hw solutions
section 4.4

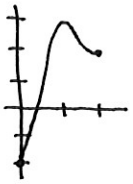
Questions 3-6: find the abs max & min if they exist.

3. 
f def on $(-\infty,\infty)$

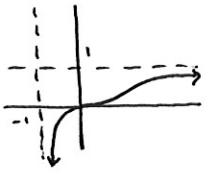
abs max: none
abs min: $x=0$

4. 
f def on $[0,\infty)$

abs max: none
abs min: $x=0$

5. 
f def on $[0,2]$

abs max: $x=1$
abs min: $x=0$

6. 
f def on $(-1,\infty)$

abs max: none
abs min: none

Questions 20-22: find the abs max/min value.

20. $g(x) = x^3+3x^2-1$ on $[-3,1]$

$g'(x) = 3x^2+6x = 0$

$3x(x+2) = 0 \Rightarrow x = 0, -2$

crit pts & endpts:
$f(-3) = (-3)^3+3(-3)^2-1 = -1$
$f(-2) = (-2)^3+3(-2)^2-1 = -8+12-1 = 3$
$f(0) = -1$
$f(1) = 1+3-1 = 3$

abs minima (min value): $y=-1$
abs maxima (max value): $y=3$

21. $g(x) = 3x^4+4x^3$ on $[-2,1]$

$g'(x) = 12x^3+12x^2 = 0$

$12x^2(x+1) = 0 \Rightarrow x = 0, -1$

$f(-2) = 3(-2)^4+4(-2)^3 = 48+-32 = 16$
$f(-1) = 3-4 = -1$
$f(0) = 0$
$f(1) = 3+4 = 7$

abs min value: $y=-1$ (at $x=-1$)
abs max value: $y=16$ (at $x=-2$)

22. $f(x) = \frac{1}{2}x^4 - \frac{2}{3}x^3 - 2x^2+3$ on $[-2,3]$

$f'(x) = 2x^3-2x^2-4x = 0$

$2x(x^2-x-2) = 0$

$2x(x-2)(x+1) = 0 \Rightarrow x = 0, 2, -1$

abs max value → $f(-2) = 8+\frac{16}{3}-8+3 = +\frac{16}{3}+\frac{9}{3} = \frac{25}{3} = 8\frac{1}{3}$
$f(-1) = \frac{1}{2}+\frac{2}{3}-2+3 = 1+\frac{7}{6} = \frac{13}{6} = 2\frac{1}{6}$
$f(0) = 3$
abs min value → $f(2) = 8-\frac{16}{3}-8+3 = -\frac{7}{3}$
$f(3) = \frac{81}{2}-18-18+3 = 40.5+3-36 = 7.5$

40. $P(x) = -10x^2+1760x-50{,}000$

maximize profit. find x & $P(x)$.

$P'(x) = -20x+1760 = 0$

$x = \frac{1760}{20} = 88$

$P(88) = 27{,}440$

So, 88 units should be rented out, giving a monthly profit of $27,440

42. $h(t) = -\frac{1}{3}t^3+4t^2+20t+2$, $t \geq 0$

find the max altitude attained by the rocket

$h'(t) = -t^2+8t+20 = 0$

$-(t^2-8t-20) = -(t-10)(t+2) = 0$

$t = 10$ (↑) or -2 ; but $t \geq 0$

max height:

$h(10) = -\frac{1}{3}\cdot 1000+400+200+2$

$= \frac{806}{3} = 268.\overline{6}$ ft

63. $A(t) = -.00005t^3-.000826t^2+.0153t+4.55$ for $5 \leq t \leq 19$. find max.

$A'(t) = -.00015t^2-.001652t+.0153 = 0$

$t = \frac{.001652 \pm \sqrt{(.001652)^2-4(-.00015)(.0153)}}{2(-.00015)}$

= plug into calculator to get

= 5.996523229 or −17.00985656

So $t = 5.996523229$

(almost 6 yrs old)