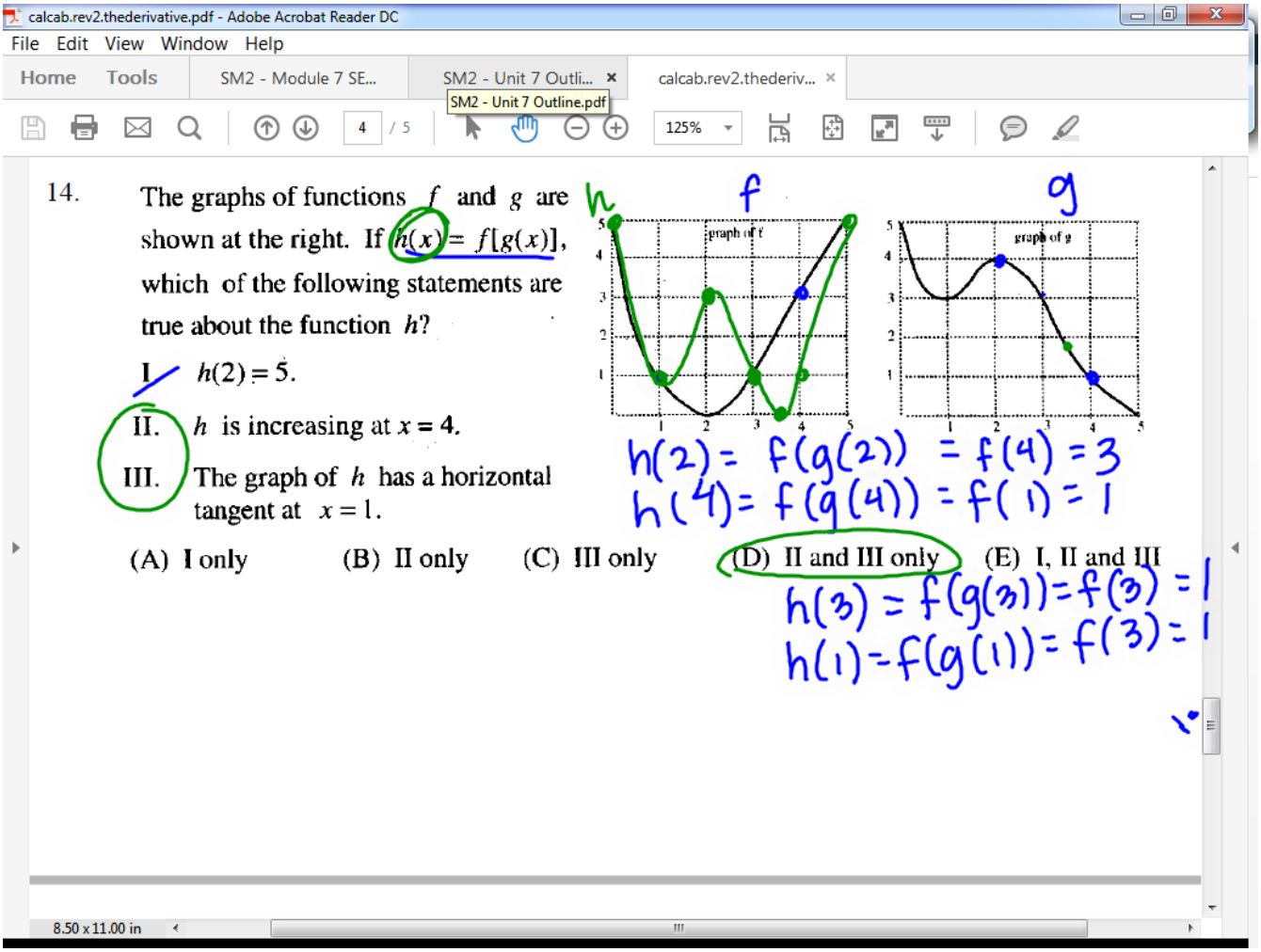
Questions on Review #2 WKS? We will finish up Review #3 notes and work on the homework for Review #3 today for 20-30ish mins and then go into Review #4.

Mar 29-2:58 PM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14. The graphs of functions f and g are shown at the right. If $h(x) = f[g(x)]$, which of the following statements are true about the function h?
I. $h(2) = 5$.
II. h is increasing at $x = 4$.
III. The graph of h has a horizontal tangent at $x = 1$.
(A) I only (B) II and III only (C) III only (D) II and III only (E) I, II and III
h
f
g
graph of f
graph of g
h(2) = f(g(2)) = f(4) = 3
h(4) = f(g(4)) = f(1) = 1
h(3) = f(g(3)) = f(3) = 1
h(1) = f(g(1)) = f(3) = 1
8.50 x 11.00 in

EXAMPLES

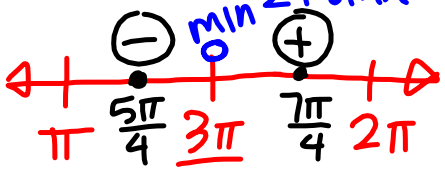
1. (No calculator) Let f be the function defined by $f(x)=\ln(2+\sin x)$ for $\pi \le x \le 2\pi$. Find the absolute maximum value and the absolute minimum value of f. Show the work that leads to your answer.

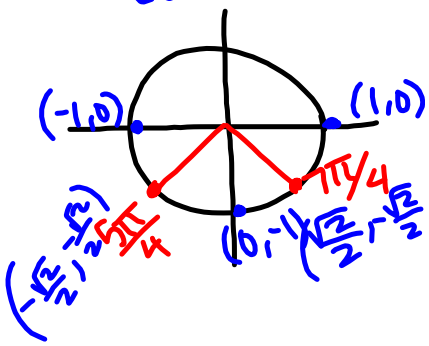
end points

$f'(x) = \frac{1}{2+\sin x} \cdot \cos x = \frac{\cos x}{2+\sin x}$

$f'(x)=0$ where $\cos x = 0$ at $x = \frac{\pi}{2}, \frac{3\pi}{2}$

$\frac{\pi}{2}$ not in domain





$f'\left(\frac{5\pi}{4}\right) = \frac{-\frac{\sqrt{2}}{2}}{2+-\frac{\sqrt{2}}{2}} = \frac{-}{+}$

$f'\left(\frac{7\pi}{4}\right) = \frac{\frac{\sqrt{2}}{2}}{2-\frac{\sqrt{2}}{2}} = \frac{+}{+}$

$f(\pi) = \ln(2+\sin\pi) = \ln(2+0) = \ln(2) =$

$f\left(\frac{3\pi}{2}\right) = \ln\left(2+\sin\left(\frac{3\pi}{2}\right)\right) = \ln(2+-1) = \ln(1) = 0$ * abs. min

$f(2\pi) = \ln(2+\sin 2\pi) = \ln(2+0) = \ln(2) =$

finish...

Finish Wednesday...

2. (Calculator allowed) The rate at which people enter an amusement park on a given day is modeled by $E(t)=\frac{15{,}600}{t^2-24t+160}$. The rate at which the people leave the same amusement park the same day is modeled by $L(t)=\frac{9890}{t^2-38t+370}$. T is measured in hours after midnight, and the functions are valid for $9\le t\le 23$. At 9 a.m. ($t=9$) there are no people in the park. At what time t is the number of people in the park a maximum?

$H(t)$ = total # of people at any time, t.

$H(t) = E(t) - L(t)$

$= \frac{15600}{t^2-24t+160} - \frac{9890}{t^2-38t+370}$

$H(t)=0$

at $t = 15.8$ hours after midnight

Lo To find: ima/minima:

EXAMPLES

3. (No calculator) Find all local extrema for the function $f(x) = 2xe^{-x}$ on the interval $(0, \infty)$.

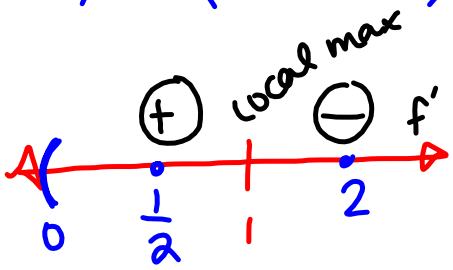
$f'(x) = 2(x \cdot e^{-x} \cdot -1 + e^{-x} \cdot 1) = 2(-xe^{-x} + e^{-x})$

$f'(x) = -2xe^{-x} + 2e^{-x}$

$0 = -2e^{-x}(x - 1)$

$0 \neq -\frac{2}{e^x}$

$x = 1$ critical point



$f'(2) = -2(2)e^{-2} + 2e^{-2}$

$= -4e^{-2} + 2e^{-2}$

$= -\frac{4}{e^2} + \frac{2}{e^2}$

$= -\frac{2}{e^2}$ (−)

$f'(\frac{1}{2}) = -2(\frac{1}{2})e^{-1/2} + 2e^{-1/2}$

$-\frac{1}{\sqrt{e}} + \frac{2}{\sqrt{e}}$

$= \frac{1}{\sqrt{e}}$ (+)

4. (Calculator allowed) Find all local extrema for the function $y = e^x - 3x^2$.

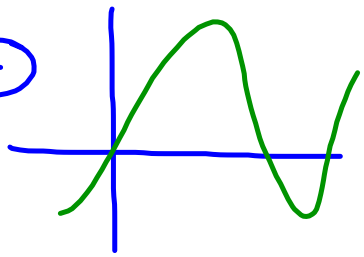
local max: 0.204

local min: 0.283

Local extrema from a graph of f'.

max: f' goes ⊕ to ⊖

min: f' goes ⊖ to ⊕



Finding points of inflection:

f''(x) = 0 and check to see where f''(x) changes from ⊕ to ⊖ or ⊖ to ⊕

Position, velocity, acceleration:

s(t) s'(t) s''(t)

speed : $|s'(t)|$

(Calculator)
A particle moves along a line in such a way that at time t, $1 \le t \le 8$, its position is given by

$$s(t) = \int_1^t [1 - x\cos t - (\ln x)(\sin x)]dx$$

(a) Write the formula for the velocity of the particle at time t.

$v(t) = 1 - t\cos t - (\ln t)(\sin t)$

(b) At what instant does the particle reach its maximum speed?

graph $v(t)$, find where $v(t) = 0$ & check endpts.

$v(1) = 0.459698$

$v(1.23) = 0.393779$

$v(3.73) = 4.83337$

$v(6.7) = -5.89644$ * max speed

$v(8) = 0.106698$

(c) When is the particle moving to the left?

$v(t) < 0$ $(5.2, 8)$

From Review #2...

Let f be a differentiable function such that $f(3)=2$ and $f'(3)=5$. If a tangent to the graph at $x=3$ is used to find an approximation of a zero of f, what is that approximation?

Write the equation of the line tangent to the graph of $f(x)=x(1-2x)^3$ at $x=1$.

Apr 3-9:06 AM