Math 1432, Section 12869
Spring 2014
Homework Assignment 1
Due Date: 1/22/14 in Lab

Name: Sol

ID:

Instructions

- Print out this file and complete the problems. You must do all the problems!
- If the problem is from the text, the section number and problem number are in parantheses.
- Use a blue or black pen or a pencil (dark).
- Write your solutions in the spaces provided. You must show work in order receive credit for a problem.
- Remember that your homework must be complete, neatly written and stapled.
- Submit the completed assignment to your Teaching Assistant in lab on the due date.
- If you do not do all of the problems, then your recitation quiz from the previous Friday will automatically become a ZERO.

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1. (Section 7.1, Problem 2)

① $f(x)=3x+5$ is a line. so b

$f'(x)=3>0 \quad \forall x \Rightarrow f$ is increasing $\Rightarrow f$ is 1-1.

② switch x and y ⇒ Then solve y.

$x=3y+5 \Rightarrow \frac{x-5}{3}=y=f^{-1}(x)$.

③ f^{-1} exists $\Rightarrow$ $\underline{x\in\mathbb{R}}$

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2. (Section 7.1, Problem 3)

① $f(x)=1-x^2$.

$f'(x)=-2x \rightarrow$ Not monotone for $\underline{x\in\mathbb{R}}$

$\Rightarrow$ Not 1-1 #

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3. (Section 7.1, Problem 5)

① $f(x)=x^5 \Rightarrow f'(x)=5x^4>0 \quad \forall x \rightarrow$ 1-1.

② $x \leftrightarrow y \Rightarrow x=y^5 \Rightarrow f^{-1}: y=x^{\frac{1}{5}}$

③ $x\in\mathbb{R}$

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4. (Section 7.1, Problem 6)

① $f(x)=x^2-3x+2$. $f'(x)=2x-3$ Not monotone

$\rightarrow$ ~~1-1~~

$f(x) = (1-x)^4$

5. (Section 7.1, Problem 10)

$f'(x) = 4(1-x)^3 \rightarrow$ Not monotone
$\rightarrow$ Not 1-1

8. (Section 7.1, Problem 21)

$f(x) = x + \frac{1}{x}$, $f'(x) = 1 + \frac{-1}{x^2} \rightarrow$ NOT MONOTONE
$\rightarrow$ NOT 1-1

6. (Section 7.1, Problem 14)

① $f(x) = 1 - (x-2)^{\frac{1}{3}}$

$f'(x) = -\frac{1}{3}(x-2)^{-\frac{2}{3}} < 0 \rightarrow$ 1-1

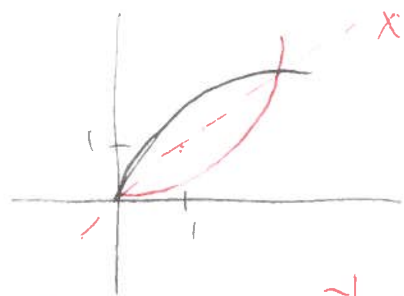
② $x \longleftrightarrow y$ $\quad x = 1-(y-2)^{\frac{1}{3}}$

$\Rightarrow 1-x = (y-2)^{\frac{1}{3}} \Rightarrow y-2 = (1-x)^3$

$y = 2+(1-x)^3$

③ $x \in \mathbb{R}$

9. (Section 7.1, Problem 30)



The graph of f^{-1} is the graph of f reflected in the line $x=y$

7. (Section 7.1, Problem 18)

$f(x) = \cos x \quad -\frac{\pi}{2} < x < \frac{\pi}{2}$

$f'(x) = -\sin x$

$\rightarrow$ NOT monotone

$\rightarrow$ NOT 1-1.

10. (Section 7.1, Problem 33a)

a. $f(x) = \frac{1}{3}x^3 + x^2 + kx$

$\Rightarrow f'(x) = x^2+2x+k > 0$ or < 0

$= x^2+2x+1 - 1+k = (x+1)^2 - 1+k$

Complete the square

$-1+k>0$

$\boxed{k>1}$

$\boxed{\text{root and graph}}$

quadratic formula

b. $g(x) = x^3+kx^2+x$

$g'(x) = 3x^2+2kx+1$

$-\sqrt{3}<k<\sqrt{3}$

$1+0+2-3 \,|\, 1$
$+1+1+3$
$1+1+3 \,|\, 0$

11. (Section 7.1, Problem 33b)

12. (Section 7.1, Problem 34a)

$f(2)=5$ $\quad f'(2)=-\frac{3}{4}$

$(f^{-1})'(5)=\frac{1}{f'(2)}=\frac{-4}{3}$

13. (Section 7.1, Problem 34b)

$g=\frac{1}{f^{-1}}=\frac{1}{h}$ $\quad g'=\frac{1}{h}=\frac{-h'}{h^2}=\frac{-(f^{-1})'}{[f^{-1}]^2}=-\frac{3}{2}\cdot\frac{1}{4}$

$=-\frac{3}{8}$

$f^{-1}=h$ $\quad (f^{-1})'(-3)=\frac{1}{f'(2)}=\frac{3}{2}$

$f^{-1}(-3)=2$

find a s.t.

14. (Section 7.1, Problem 36)

$f(x)=1-2x-x^3$

$f'(x)=-2-2x^2<0$

$\Rightarrow$ 1-1 ✓

$f(a)=4 \Rightarrow a=1$

$1-2a-a^3=4$

$a^3+2a-3=0$

$(a-1)(a^2+a+3)=0$

$(f^{-1})'(4)=\frac{1}{f'(a)}=\frac{1}{f'(1)}=\frac{1}{-4}$

15. (Section 7.1, Problem 37)

$f(x)=x+2\sqrt{x}$, $x>0$, $c=8$

$f'(x)=1+x^{-\frac{1}{2}}>0$

$\Rightarrow$ 1-1

$f(a)=8 \Rightarrow a=4$

$\Rightarrow a+2\sqrt{a}-8=0$

$\Rightarrow (\sqrt{a}+4)(\sqrt{a}-2)=0$

$\sqrt{a}=2$

$a=4$.

$(f^{-1})'(8)=\frac{1}{f'(4)}=\frac{2}{3}$

16. (Section 7.1, Problem 39)

$f(x)=2x+\cos x$

$f'(x)=2-\sin x>0$ $\quad c=\pi$

$f(a)=\pi \Rightarrow 2a+\cos a=\pi \Rightarrow a=\frac{\pi}{2}$

$(f^{-1})'(\pi)=\frac{1}{f'(\frac{\pi}{2})}=\frac{1}{1}=1$

Differentials estimates

$f(x+h) = f(x) + hf'(x)$

17. (Section 7.2, Problem 3)

$\ln 1.6 = \ln \frac{16}{10} = 4\ln 2 - \ln 10$

$= 4 \cdot 0.69 - 2.3$

$= 2.76 - 2.3$

$= 0.46$

18. (Section 7.2, Problem 8)

$\ln\sqrt{630} = \frac{1}{2}\ln 630$

$= \frac{1}{2}(\ln 7 + \ln 9 + \ln 10)$

$= \frac{1}{2}(1.95 + 2.20 + 2.3)$

$= \frac{6.45}{2} = 3.225$

19. (Section 7.2, Problem 13)

$f = \frac{1}{t}$ (decreasing)

p	max	length	min
$[1, \frac{9}{8}]$	1	$\frac{1}{8}$	$\frac{8}{9}$
$[\frac{9}{8}, \frac{10}{8}]$	$\frac{8}{9}$	$\frac{1}{8}$	$\frac{8}{10}$
$[\frac{10}{8}, \frac{11}{8}]$	$\frac{8}{10}$	$\frac{1}{8}$	$\frac{8}{11}$
$[\frac{11}{8}, \frac{12}{8}]$	$\frac{8}{11}$	$\frac{1}{8}$	$\frac{8}{12}$

$Uf(p) = \frac{1}{8} + \frac{1}{9} + \frac{1}{10} + \frac{1}{11}$

$Lf(p) = \frac{1}{9} + \frac{1}{10} + \frac{1}{11} + \frac{1}{12}$

$\frac{1}{2}[Uf(p) + Lf(p)]$

$= \frac{1}{2}\left[\frac{1}{8} + \frac{1}{12} + \frac{2}{9} + \frac{2}{10} + \frac{2}{11}\right] = 0.406$

20. (Section 7.2, Problem 15b)

$f(x) = \ln x$, $x = 5$, $h = -0.2$

$f'(x) = \frac{1}{x}$

$\ln 4.8 = f(4.8) = f(5) - 0.2 f'(5)$

$= \ln 5 - 0.2 \cdot \frac{1}{5} = 1.61 - 0.04$

$= 1.57$

21. (Section 7.2, Problem 20)

$2\ln x = \ln(2x-1)$ $x > 0$

$\Rightarrow \ln x^2 = \ln(2x-1)^2$ $2x-1>0$

$x = (2x-1)^2$

$4x^2 - 5x + 1 = 0$ $x = 1$ or $\frac{1}{4}$

22. (Section 7.2, Problem 21)