

MATH 100-D200 Instructor: R. Pyke
Midterm 2, *Version 2*, November 6, 2008

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1. DO NOT LIFT UP THE COVER PAGE UNTIL INSTRUCTED.
2. Clearly explain your answer. No credit will be given for just writing down the answer.
3. If the answer space provided is not sufficient, write your answer on the back of the previous page.
4. Ordinary Scientific Calculators ONLY are allowed.
NO GRAPHING CALCULATORS ALLOWED.
5. **Copying someone else's test, or deliberately exposing written papers to the view of others is forbidden and will result in a score of zero and disciplinary action.**

Question	Score	Max
1		4
2		4
3		9
4		10
5		10
6		10
7		4
8		4
Total		55

(1) [Marks: 4] Express $f(x) = \left| \frac{2x - 4}{3x + 2} \right|$ as a piecewise function.

(2) [Marks: 4] Consider the following functions;

$D(p)$ is the distance (in kilometres) one can travel on a train by buying a ticket worth p dollars

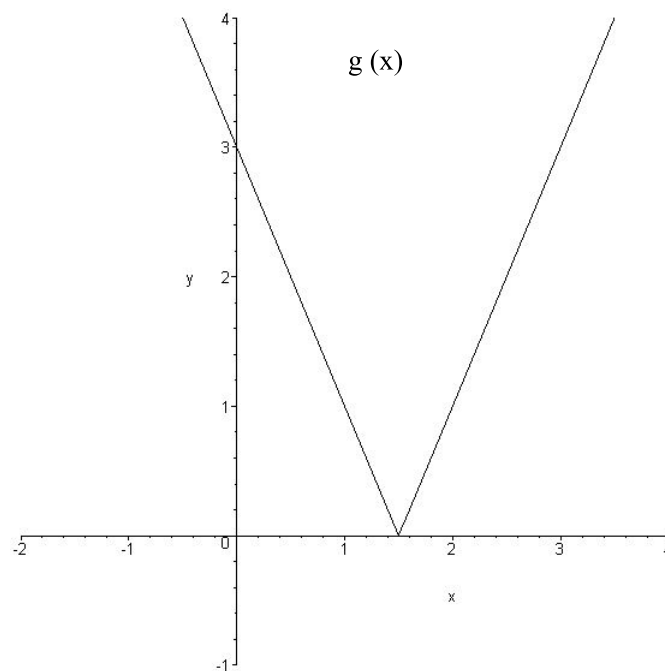
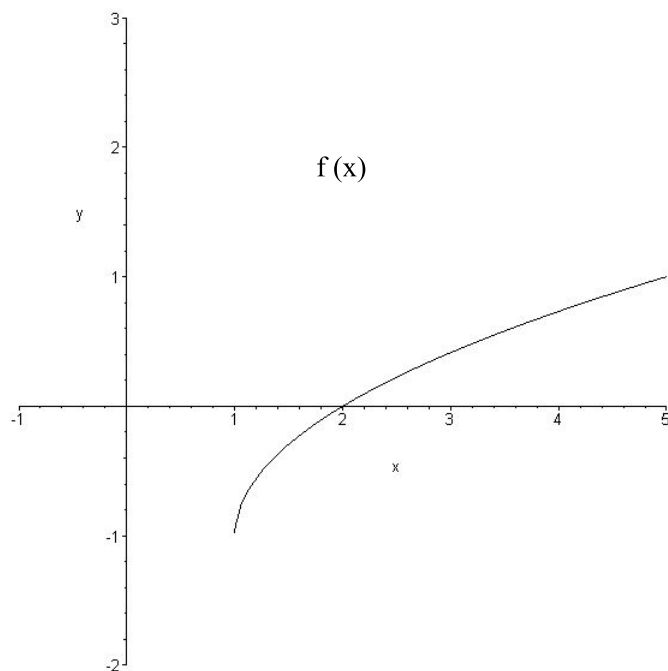
$T(d)$ is the time taken (in hours) to travel on a train a distance of d kilometres

$W(t)$ is Bill's weekly salary (in dollars) where t is the week of the year (1 - 52)

(a) What is the meaning of the following function; $T \circ D$?

(b) What combination of two or more of these 3 functions will tell you how far Bill can travel by train each week if he uses his entire weekly salary?

- (3) [Marks: 9] Below are the graphs of two functions $f(x)$ and $g(x)$. The domain of $f(x)$ is $[1, \infty)$ and the range of $f(x)$ is $[-1, \infty)$. The domain of $g(x)$ is $(-\infty, \infty)$ and the range of $g(x)$ is $[0, \infty)$.



- (a) Using these graphs, determine (approximately) the value of $(f \circ g)(0)$ and $(g \circ f)(4)$. Explain your reasoning by referring to the graphs.

- (b) Determine an (approximate) x for which $(f \circ g)(x) = -1/2$. Explain your reasoning by referring to the graphs.

- (b) Determine the domain and range of $f \circ g$.

(4) [Marks: 10] (a) Prove that $h(x) = \frac{|3x|}{1 - 2x^2}$ is not one-to-one.

(b) Prove that $f(x) = 3 + \sqrt{x^3 - 7}$ is one-to-one.

(c) Find $f^{-1}(x)$.

(d) Verify that $(f^{-1} \circ f)(x) = x$.

- (5) [Marks: 10] Sketch **two** possible graphs of $p(x) = -2x^3(x - 1)^3(x + 2)^2$. Make use of the shape of the graph near the zeros, all intercepts, end behaviour, and the number of possible points where the tangent line is horizontal.

- (6) [Marks: 9] Sketch the graph of $R(x) = \frac{-4x^2 - 8x + 12}{3x + 2}$. Find all intercepts, asymptotes, and determine how the graph approaches the asymptotes.

- (7) [Marks: 4] Given that 2 is a root of $p(x) = x^4 - 5x^3 + 7x^2 + 3x - 10$, find the complete factorization of $p(x)$.

- (8) [Marks: 4] Find the partial fraction decomposition of $f(x) = \frac{-2}{3(x-1)(2x+1)(3x+2)}$