

## Chapter 1: Practice/review problems

The collection of problems listed below contains questions taken from previous MA123 exams.

## Warm ups

[1]. A rectangular solid has edges of lengths 4 ft, 5 ft, and 8 ft. Suppose we double the length of two of the sides. What is the volume of the new rectangular solid?

- (a)  $80 \text{ ft}^3$       (b)  $160 \text{ ft}^3$       (c)  $320 \text{ ft}^3$       (d)  $640 \text{ ft}^3$       (e)  $1280 \text{ ft}^3$

[2]. If we simplify the expression

$$\frac{a^5b^8 - a^4b^7}{a(ab^2)^2}$$

to the form  $a^Pb^Q - a^Rb^S$ , then  $R =$

- (a) 0      (b) 1      (c) 2      (d) 3      (e) 4

## Domain and inequalities

[3]. Suppose  $F(x) = 1/(x^2 - 5)$ . What is the largest value of  $A$  such that  $F(x)$  is defined on the interval  $[-10, A)$ ?

- (a)  $-\sqrt{5}$       (b)  $-1$       (c) 0      (d) 1      (e)  $\sqrt{5}$

[4]. What is the largest value of  $A$  such that the function  $f(t)$  is defined on the interval  $(0, A)$  where

$$f(t) = \frac{1}{t^3 - 8}$$

- (a) 1      (b) 2      (c) 3      (d) 4      (e) 5

[5]. The inequality  $x^2 + x - 2 > 0$  is equivalent to

- (a)  $x < -2$  or  $x > 1$       (b)  $-2 < x$  and  $x < 1$       (c)  $x = -2$  or  $x = 1$   
 (d)  $x < -\sqrt{2}$  or  $x > 1$       (e)  $x = -\sqrt{2}$  and  $x = 1$

[6]. The inequality  $x^2 + 2x - 15 \leq 0$  can be rewritten in the form

- (a)  $x \leq -3$  or  $x \geq 5$       (b)  $-5 \leq x \leq 3$       (c)  $x \geq 15/2$   
 (d)  $x \leq -5$  or  $x \geq 3$       (e)  $-3 \leq x \leq 5$

[7]. The values of  $x$  satisfying the inequality  $x^2 + 5x - 24 < 0$  are

- (a)  $x < -8$  and  $x > 3$                       (b)  $x < 8$  and  $x > -3$                       (c) Cannot be determined  
(d)  $-3 < x < 8$                                       (e)  $-8 < x < 3$

[8]. Suppose  $F(x) = \sqrt{x^2 - 2x - 3}$ .

What is the largest value of  $A$  such that  $F(x)$  is defined on the interval  $[-5, A]$ ?

- (a)  $-4$                       (b)  $-3$                       (c)  $-2$                       (d)  $-1$                       (e)  $0$

[9]. Find the domain of the function

$$F(s) = \frac{1}{\sqrt{s^2 - 1}}$$

- (a) All  $s$  such that either  $-\infty < s < -1$  or  $1 < s < \infty$   
(b) All  $s$  such that  $-1 < s < 1$   
(c) All  $s$  such that  $-\infty < s < \infty$   
(d) All  $s$  such that either  $-\infty < s < 1$  or  $1 < s < \infty$   
(e) All  $s$  such that  $0 < s < 1$

[10]. The inequality  $|x - 1| > 2$  is equivalent to

- (a)  $x < 2$  or  $x > 1$                       (b)  $2 < x$  and  $x < 1$                       (c)  $x > 3$  or  $x < -1$   
(d)  $x > 3$  or  $x < 1$                       (e)  $x > 2$  and  $x > 1$

### Composition of functions

[11]. If  $h(x) = \sqrt{x^2 + 1}$  and  $g(x) = 2x - 1$  then  $h(g(x)) =$

- (a)  $4x$                                       (b)  $\sqrt{4x^2 - 4x + 2}$                                       (c)  $2\sqrt{x^2 + 1} - 1$   
(d)  $\sqrt{4x^2 - 4x + 1}$                                       (e)  $2x^2 - 1$

[12]. If  $h(x) = \frac{1}{x^2 + 1}$  and  $g(3) = -1$  then  $h(g(3)) =$

- (a)  $1/10$                       (b)  $1/5$                       (c)  $1/2$                       (d)  $1/3$                       (e) undefined

[13]. If  $P(s) = s^2 + 1$  and  $R(t) = t - 2$ , then  $P(R(x)) =$

- (a)  $x^2 - 4x + 5$                                       (b)  $x^2 + 4x + 3$                                       (c)  $x^2 - 1$   
(d)  $x^2 + 5$                                       (e)  $(x^2 + 1)(x - 2)$

[14]. If  $u(t) = t + 7$  then  $u(v(x)) = x$  if  $v(x) =$

- (a)  $x + 7$                       (b)  $1$                       (c)  $x - 7$                       (d)  $0$                       (e)  $x$

[15]. If  $a(t) = t - 4$ , find a function  $b(t)$  such that  $a(b(t)) = t$ .

- (a)  $b(t) = t$       (b)  $b(t) = 4$       (c)  $b(t) = t - 4$       (d)  $b(t) = t + 4$       (e)  $b(t) = 4 - t$

[16]. If  $R(t) = t + 2$  and  $R(Q(t)) = t$  then

- (a)  $Q(t) = 2t$       (b)  $Q(t) = t$       (c)  $Q(t) = t - 2$       (d)  $Q(t) = t + 2$       (e)  $Q(t) = 2 - t$

[17]. If  $u(t) = \frac{1}{t+1}$  then  $u(v(x)) = x$  if  $v(x) =$

- (a)  $1/(x-1)$       (b)  $1/(x+1)$       (c)  $(1/x)+1$       (d)  $(1/x)-1$       (e)  $x$

**Lines and parabolas**

[18]. An equation of a line through the points  $(3, 5)$  and  $(8, 7)$  in the  $(s, t)$  plane is

- (a)  $s = 6 + 5(t - 5)$       (b)  $t = 6 + 5(s - 5)$       (c)  $2t = 6 + 5(s - 5)$   
(d)  $2s = 6 + 5(t - 5)$       (e)  $s = 5 + 6(t - 5)$

[19]. If the equation of the line through the points  $(3, 0)$  and  $(2, 1)$  is written as

$$y = A + B(x - 2)$$

then

- (a)  $A = 1$  and  $B = -1$       (b)  $A = 3$  and  $B = -1$       (c)  $A = -1$  and  $B = 3$   
(d)  $A = -1$  and  $B = 1$       (e)  $A = 5$  and  $B = -1$

[20]. Find  $A$  and  $B$  such that the equation of the line through  $(1, 3)$  and  $(2, 7)$  can be written as

$$y = A + B(x - 2).$$

- (a)  $A = 4$  and  $B = 7$       (b)  $A = 7$  and  $B = 4$       (c)  $A = 3$  and  $B = 1$   
(d)  $A = 7$  and  $B = 2$       (e) This is not possible

[21]. The line defined by the equation  $y = 2 + A(x - 1)$  passes through the point  $(5, 3)$ . The slope of the line is

- (a) 0      (b)  $1/4$       (c)  $1/2$       (d) 2      (e) 4

[22]. If the line given by  $s = A + B(t - 1)$  is perpendicular to the line  $s = t$  and contains the point  $(1, 6)$  in the  $(t, s)$ -plane, then

- (a)  $A = 1, B = 4$       (b)  $A = 4, B = 1$       (c)  $A = 1, B = 6$   
(d)  $A = 4, B = -1$       (e)  $A = 6, B = -1$

- [23]. The following table gives the Median Weekly Earnings in dollars for wage and salary workers in the U.S. from 2000 to 2006. (Data from the Bureau of Labor Statistics) Use the given values from the table for the two years, 2000 and 2005, to express earning amount as a linear function of time in years. Let  $A$  denote amount earned (in dollars) and let  $t$  denote time (in years).

Yr.	2000	2001	2002	2003	2004	2005	2006
Amount	576	596	608	620	640	651	671

- (a)  $A = 576 + 12(t - 2000)$       (b)  $A = 576 + 13(t - 2000)$       (c)  $A = 576 + 14(t - 2000)$   
 (d)  $A = 576 + 15(t - 2000)$       (e)  $A = 576 + 16(t - 2000)$
- [24]. Find an equation for the line that is perpendicular to the line  $y = 2x$  and contains the point  $(-1, 5)$
- (a)  $y = 5 + 2(x + 1)$       (b)  $y = 5 + 2(x - 1)$       (c)  $y = 5 + \frac{1}{2}(x + 1)$   
 (d)  $y = 5 + -2(x + 1)$       (e)  $y = 5 - \frac{1}{2}(x + 1)$
- [25]. Suppose the parabola given by the equation  $y = A + B(x + 1) + C(x + 1)(x - 2)$  contains the points  $(-1, 3)$ ,  $(2, 6)$ , and  $(3, 7)$ . What is the value of  $B$ ?
- (a)  $-2$       (b)  $-1$       (c)  $0$       (d)  $1$       (e)  $2$

**Systems of quadratic equations**

- [26]. The area of a right triangle is 8. The sum of the lengths of the two sides adjacent to the right angle of the triangle is 10. What is the length of the hypotenuse of the triangle?
- (a)  $10$       (b)  $\sqrt{52}$       (c)  $8$       (d)  $\sqrt{68}$       (e)  $6$