Chapter 3: Practice/review problems

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

Limits and one-sided limits

[1]. Suppose $H(t) = t^2 + 5t + 1$. Find the limit $\lim_{t \to 2} H(t)$.

(a) 15 **(b)** 1 **(c)** 9 **(d)** 6 **(e)** $2t + 5$

[2]. Find the limit $\lim_{t \to 2} \dfrac{t^2 - 4}{t - 2}$.

(a) 2 **(b)** 4 **(c)** 6 **(d)** 8 **(e)** The limit does not exist

[3]. Find the limit $\lim_{x \to 5} \dfrac{x - 5}{x^2 - 25}$.

(a) $-\dfrac{1}{10}$ **(b)** $-\dfrac{1}{5}$ **(c)** 0 **(d)** $\dfrac{1}{5}$ **(e)** $\dfrac{1}{10}$

[4]. Compute $\lim_{x \to 3} \dfrac{x^2 - 7x + 12}{x - 3}$.

(a) 0 **(b)** 1 **(c)** -1 **(d)** 2 **(e)** The limit does not exist

[5]. Find $\lim_{r \to 1} \dfrac{r^2 - 3r + 2}{r - 1}$.

(a) 1 **(b)** 0 **(c)** -1 **(d)** 2 **(e)** The limit does not exist

[6]. Find the limit or state that it does not exist: $\lim_{x \to 4} \dfrac{x^2 + x - 20}{x - 4}$.

(a) 8 **(b)** -20 **(c)** -15 **(d)** 9 **(e)** Does Not Exist

[7]. Compute $\lim_{x \to 0} \left(\dfrac{2x^2 - 3x + 4}{x} + \dfrac{5x - 4}{x} \right)$.

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

[8]. Compute $\lim_{h \to 0} \dfrac{(h + 4)^2 - 16}{h}$.

(a) 4 **(b)** 5 **(c)** 6 **(d)** 7 **(e)** 8

[9]. Find the limit $\lim_{t\to 0^+} \dfrac{\sqrt{t^3}}{\sqrt{t}}$.

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3 **(e)** The limit does not exist

[10]. Find the limit as x tends to 0 from the left $\lim_{x\to 0^-} \dfrac{|x|}{2x}$.

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

[11]. Find the limit $\lim_{h\to 0^-} \dfrac{|4h|}{h}$.

(**Hint:** Evaluate the quotient for some negative values of h close to 0.)

(a) 0 **(b)** 2 **(c)** -2 **(d)** 4 **(e)** -4

[12]. Compute $\lim_{x\to 3^-} \dfrac{|4x-12|}{x-3}$.

(a) 4 **(b)** -4 **(c)** 0 **(d)** Doesn't exist **(e)** Cannot be determined

[13]. Find the limit of $f(x)$ as x tends to 2 from the left if $f(x) = \begin{cases} 1+x^2 & \text{if } x<2 \\ x^3 & \text{if } x\geq 2 \end{cases}$

(a) 5 **(b)** 6 **(c)** 7 **(d)** 8 **(e)** 9

[14]. Find the limit of $f(x)$ as x tends to 2 from the left if $f(x) = \begin{cases} x^3-2 & \text{if } x\geq 2 \\ 1+x^2 & \text{if } x<2 \end{cases}$

(a) 5 **(b)** 6 **(c)** 7 **(d)** 8 **(e)** Does not exist

[15]. For the function $f(x) = \begin{cases} 4x^2-1 & \text{if } x<1 \\ 3x+2 & \text{if } x\geq 1 \end{cases}$

Find $\lim_{x\to 1^+} f(x)$.

(a) 5 **(b)** 3 **(c)** 1 **(d)** 0 **(e)** The limit does not exist

[16]. Let $f(x) = \begin{cases} x^2+8x+15 & \text{if } x\leq 2 \\ 4x+7 & \text{if } x>2. \end{cases}$

Find $\lim_{x\to 2^+} f(x)$.

(a) 15 **(b)** 20 **(c)** 30 **(d)** 35 **(e)** The limit does not exist

[17]. Let $f(x) = \begin{cases} -5x + 7 & \text{if } x < 3 \\ x^2 - 16 & \text{if } x \geq 3. \end{cases}$

Find $\lim_{x \to 3^+} f(x)$.

(a) 6 **(b)** -6 **(c)** -7 **(d)** -8 **(e)** The limit does not exist

[18]. Suppose $f(t) = \begin{cases} -t & \text{if } t < 1 \\ t^2 & \text{if } t \geq 1 \end{cases}$

Find the limit $\lim_{t \to 1} f(t)$.

(a) -1 **(b)** 1 **(c)** 0 **(d)** 2 **(e)** The limit does not exist

[19]. Suppose $f(t) = \begin{cases} (-t)^2 & \text{if } t < 1 \\ t^3 & \text{if } t \geq 1 \end{cases}$

Find the limit $\lim_{t \to 1} f(t)$.

(a) -2 **(b)** -1 **(c)** 1 **(d)** 2 **(e)** The limit does not exist

[20]. Suppose the total cost, $C(q)$, of producing a quantity q of a product equals a fixed cost of \$1000 plus \$3 times the quantity produced. So total cost in dollars is

$$C(q) = 1000 + 3q.$$

The average cost per unit quantity, $A(q)$, equals the total cost, $C(q)$, divided by the quantity produced, q. Find the limiting value of the average cost per unit as q tends to 0 from the right. In other words find

$$\lim_{q \to 0^+} A(q)$$

(a) 0 **(b)** 3 **(c)** 1000 **(d)** 1003 **(e)** The limit does not exist

Limits at infinity

[21]. Find the limit $\lim_{t \to \infty} \frac{3}{1 + t^2}$.

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3 **(e)** The limit does not exist

[22]. Find the limit $\lim_{x \to \infty} \frac{x^2 + x + 1}{(3x + 2)^2}$.

(a) 1 **(b)** 1/3 **(c)** 0 **(d)** 1/9 **(e)** The limit does not exist

[23]. Find the limit $\lim_{s \to \infty} \frac{s^4 + s^2 + 13}{s^3 + 8s + 9}$.

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3 **(e)** The limit does not exist