

MA123 Exam 1

September 19 2007

Instructions. Circle your answer in ink on the page containing the problem and on the cover sheet. After the exam begins, you may not ask a question about the exam. Be sure you have all pages (containing 15 problems) before you begin. You may use the following formula for the derivative of a quadratic function. If

$$p(x) = Ax^2 + Bx + C$$

then

$$p'(x) = 2Ax + B$$

1. 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
2. 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
3. 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 $x > 1$

4. 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) $\sqrt{5}$

5. 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

6. If $f(t) = 3t^2 + 4$ then

$$\frac{f(1+h) - f(1)}{h} =$$

- (a) $4 + 3h$
- (b) $3 + 4h$
- (c) $6 + 3h$
- (d) $8 + 3h$
- (e) $8 + 4h$

7. A train travels from A to B to C. The distance from A to B is 10 miles and the distance from B to C is 40 miles. The average speed from A to B was 20 miles per hour and the average speed from B to C was 40 miles per hour. What was the average speed from A to C in miles per hour?
- (a) $180/5$
 - (b) $90/3$
 - (c) $100/3$
 - (d) $180/3$
 - (e) $100/5$
8. If $g(x) = (x - 1)^2$ what is the average rate of change of $g(x)$ with respect to x as x changes from -3 to 3 ?
- (a) -4
 - (b) -2
 - (c) 0
 - (d) 2
 - (e) 4
9. If $g(s) = 3s^2 + 2s - 2$ what is the value of s for which the instantaneous rate of change of $g(s)$ with respect to s equals 8 ?
- (a) -2
 - (b) -1
 - (c) 0
 - (d) 1
 - (e) 2

10. Suppose $g(s) = s^2 + 4s + 1$. Find a point of the graph of $t = g(s)$ such that the tangent line to the graph is parallel to the s axis.

- (a) $(2, 9)$
- (b) $(-1, -2)$
- (c) $(-2, -3)$
- (d) $(-4, 8)$
- (e) $(-4, 1)$

11. A train travels from city A to city B. The cities are 600 miles apart. The distance from city A at t hours after it leaves A is given by

$$d(t) = 50t + t^2$$

What is the average speed of the train in miles per hour during the trip from A to B? Hint: First find how long it takes for the train to get from A to B.

- (a) 50
- (b) 55
- (c) 60
- (d) 65
- (e) 70

12. Suppose

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

Find the limit

$$\lim_{t \rightarrow 1} f(t)$$

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

13. Suppose

$$f(t) = \begin{cases} Bt & \text{if } t \leq 3 \\ 5 & \text{if } t > 3 \end{cases}$$

Find a value of B such that the function $f(t)$ is continuous for all t .

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

14. Find the limit

$$\lim_{t \rightarrow \infty} \frac{3}{1 + t^2}$$

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

15. Suppose the total cost, $C(q)$, of producing a quantity q of a product is given by the equation

$$C(q) = 5000 + 5q$$

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 ∞ . In other words find

$$\lim_{q \rightarrow \infty} A(q)$$

- (a) 5
- (b) 6
- (c) 5000
- (d) 5006
- (e) The limit does not exist