MA123 — Elem. Calculus Fall 2013
Exam 3 2013-11-21

Name: _____ **Sec.:** _____

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The exam consists of multiple choice questions. Record your answers on this page. For each multiple choice question, you will need to fill in the box corresponding to the correct answer. For example, if (a) is correct, you must write

(a) **b** **c** **d** **e**

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GOOD LUCK!

1.	**a**	**b**	**c**	**d**	**e**	**11.**	**a**	**b**	**c**	**d**	**e**
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4.	**a**	**b**	**c**	**d**	**e**	**14.**	**a**	**b**	**c**	**d**	**e**
5.	**a**	**b**	**c**	**d**	**e**	**15.**	**a**	**b**	**c**	**d**	**e**
6.	**a**	**b**	**c**	**d**	**e**	**16.**	**a**	**b**	**c**	**d**	**e**
7.	**a**	**b**	**c**	**d**	**e**	**17.**	**a**	**b**	**c**	**d**	**e**
8.	**a**	**b**	**c**	**d**	**e**	**18.**	**a**	**b**	**c**	**d**	**e**
9.	**a**	**b**	**c**	**d**	**e**	**19.**	**a**	**b**	**c**	**d**	**e**
10.	**a**	**b**	**c**	**d**	**e**	**20.**	**a**	**b**	**c**	**d**	**e**

For grading use:

Number Correct	
	(out of 20 problems)

Total	
	(out of 100 points)

Please make sure to list the correct section number on the front page of your exam. In case you forgot your section number, consult the following table. Your section number is determined by your recitation time and location.

Section #	**Instructor**	**Day**	**Time**	**Room**
001-006	Jack Schmidt	MWF	08:00 am - 08:50 am	KAS 213
001	Jinping Zhuge	T	8:00 am - 9:15 am	FB B9
002	Yiyuan Wu	T	9:30 am - 10:45 am	NURS 501B
003	Devin Willmott	T	8:00 am - 9:15 am	CB 235
004	Tefjol Pllaha	T	8:00 am - 9:15 am	CB 237
005	Tefjol Pllaha	T	2:00 pm - 3:15 pm	CB 347
006	Tefjol Pllaha	T	3:30 pm - 4:45 pm	CB 347
007-012	Jack Schmidt	MWF	09:00 am - 09:50 am	KAS 213
007	Yiyuan Wu	R	8:00 am - 9:15 am	CB 217
008	Jinping Zhuge	R	9:30 am - 10:45 am	DH 323
009	Yiyuan Wu	R	11:00 am - 12:15 pm	EH 202
010	Jinping Zhuge	R	12:30 pm - 1:45 pm	DH 323
011	Dharma Maharjan	R	2:00 pm - 3:15 pm	CB 347
012	Dharma Maharjan	R	3:30 pm - 4:45 pm	CB 347
013-018	Paul Koester	MWF	1:00 pm - 1:50 pm	BS 116
013	Carolyn Troha	T	8:00 am - 9:15 am	CB 345
014	Carolyn Troha	T	9:30 am - 10:45 am	NURS 214
015	Morgan Schreffler	T	11:00 am - 12:15 pm	EH 202
016	Carolyn Troha	T	12:30 pm - 1:45 pm	MMRB 243
017	Morgan Schreffler	T	2:00 pm - 3:15 pm	BH 301
018	Morgan Schreffler	T	3:30 pm - 4:45 pm	CB 235
025-030	Paul Koester	MWF	2:00 pm - 2:50 pm	BS 107
025	Sarah Orchard	T	12:30 pm - 1:45 pm	TPC 212
026	Marie Meyer	R	8:00 am - 9:15 am	CB 240
027	Marie Meyer	T	2:00 pm - 3:15 pm	DH 331
028	Marie Meyer	R	2:00 pm - 3:15 pm	EH 304
029	Sarah Orchard	T	3:30 pm - 4:45 pm	OT OB7
030	Sarah Orchard	R	3:30 pm - 4:45 pm	OT 0B7
401	Brad Schwer	MTR	5:30 pm - 6:45 pm	CB 337

Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

1. Find the largest value of A such that the function $f(t) = t^3 + 6t^2 - 96t - 2$ is decreasing for all t in the interval $(0, A)$.

   Possibilities:

   (a) -2

   (b) 8

   (c) ∞

   (d) -8

   (e) 4

2. Suppose $g'(t) = (t-2)(t-3)(t-9)$. Find the largest value of A such that the function $g(t)$ is increasing for all t in the interval $(2, A)$.

   Possibilities:

   (a) ∞

   (b) 2

   (c) 54

   (d) 3

   (e) 9

3. Suppose the derivative of $H(s)$ is given by $H'(s) = s^2(s-6)(s^2+1)$. Find the value of s in the interval $[-10, 10]$ where $H(s)$ takes on its minimum.

   Possibilities:

   (a) 7

   (b) 1

   (c) 0

   (d) 6

   (e) -1

4. If $f(x) = xe^{2x}$, find the largest interval on which $f(x)$ is concave upward. If we write the interval as (a, ∞), then what is a?

Possibilities:

(a) -1

(b) 3

(c) $-\frac{1}{2}$

(d) 2

(e) 1

---

5. Suppose the derivative of $h(x)$ is given by $h'(x) = (x-4)(x-8)$ If $h(x)$ is concave upward on the interval (a, ∞), what is a?

Possibilities:

(a) 6

(b) 12

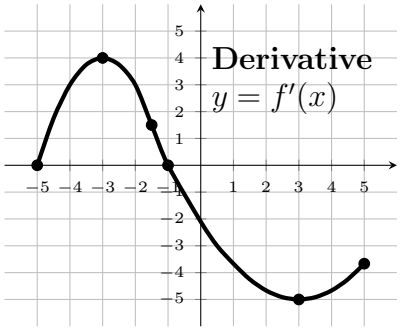
(c) 4

(d) $-\infty$

(e) 8

---

6. The following is the graph of the derivative, $f'(x)$, of the function $f(x)$. The zeroes, local extrema, and points of inflection of $f'(x)$ are marked. Where is $f(x)$ increasing?



Possibilities:

(a) between -5 and -1.5

(b) between -1 and 5

(c) between -5 and -3, also between 3 and 5

(d) between -3 and 3

(e) between -5 and -1

---

7. Find the area of the largest rectangle whose sides are parallel to the coordinate axes, whose bottom-left corner is at $(0, 0)$ and whose top-right corner is on the graph of $y = 12x - x^2$.

Possibilities:

(a) 0

(b) 256

(c) 216

(d) 132

(e) 6

---

8. Find the point in the first quadrant that lies on the hyperbola $y^2 - x^2 = 3$ and is closest to the point $(2, 0)$.

Possibilities:

(a) $(2, \sqrt{7})$

(b) $(6, \sqrt{39})$

(c) $(0, \sqrt{3})$

(d) $(1, 2)$

(e) $(7, 2\sqrt{13})$

---

9. A farmer builds a rectangular pen with 5 vertical partitions (i.e. 6 vertical sides) using 700 feet of fencing. What is the maximum possible total area of the pen?

Possibilities:

(a) 175

(b) $\frac{30625}{3}$

(c) 700

(d) 30625

(e) $\frac{175}{3}$

---

10. The surface area of a sphere of radius r is given by the formula $4\pi r^2$. A certain sphere's radius is growing at a constant speed of .1 meters per year. How fast is the surface area of this sphere changing when the radius is 1000 meters?

Possibilities:

(a) .1256637062 square meters per year

(b) 2513.274123 square meters per year

(c) 1256637.062 square meters per year

(d) 12566370.62 square meters per year

(e) 25132.74123 square meters per year

---

11. A ladder 30 feet long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 11 feet per second, how fast is the top of the ladder sliding down the wall (in feet per second) when the bottom of the ladder is 24 feet from the wall? (answer should be positive)

Possibilities:

(a) 4

(b) $\frac{33}{4}$

(c) $\frac{44}{3}$

(d) $\frac{88}{3}$

(e) 11

---

12. Estimate the area under the graph of $x^2 - 5x$ for x between 3 and 11, by using a partition that consists of 4 equal subintervals of $[3, 11]$ and use the right endpoint of each subinterval as a sample point.

Possibilities:

(a) $\frac{464}{3}$

(b) 232

(c) 220

(d) 88

(e) 116

---

13. A train travels in a straight westward direction along a track. The speed of the train varies, but it is measured at regular time intervals of 1/10 hour. The measurements for the first half hour are:

time	0	.1	.2	.3	.4	.5
speed	0	6	9	13	20	26

Estimate the total distance (in miles) traveled by the train during the first half hour by assuming the speed is a linear function of t on the subintervals. The speed in the table is given in miles per hour. Use all six speed measurements in your estimate.

Possibilities:

(a) 6.5

(b) 3.0

(c) 13.0

(d) 7.4

(e) 6.1

---

14. One way to approximate $\int_7^{57} e^{15-2x}\,\mathrm{d}x$ is with the sum $\sum_{k=1}^{100}\left((\Delta x)\cdot\left(e^{15-2(7+k\Delta x)}\right)\right)$. What is the best value of Δx to use?

Possibilities:

(a) $\frac{1}{2}$

(b) 100

(c) 7

(d) 1.359140914

(e) 57

---

15. Suppose you estimate the area under the graph of $f(x) = x^3$ from $x = 7$ to $x = 27$ by adding the areas of the rectangles as follows: partition the interval into 20 equal subintervals and use the right endpoint of each interval to determine the height of the rectangle. What is the area of the 15th rectangle?

Possibilities:

(a) $\frac{39775}{4}$

(b) 142100

(c) 9261

(d) 10648

(e) 27

---

16. Evaluate the sum

$$\sum_{k=4}^{6}(6k^3+3)$$

Possibilities:

(a) 1686

(b) 1299

(c) 2439

(d) 387

(e) 21

---

17. Evaluate the sum

$$\sum_{k=1}^{13}\left(6k^2\right)$$

Possibilities:

(a) 4914

(b) 1014

(c) 546

(d) 819

(e) 1020

---

18. Evaluate the sum $6+12+18+24+\cdots+600$.

Possibilities:

(a) 180300

(b) 660

(c) 4

(d) 5

(e) 30300

---

19. Evaluate the sum $\sum_{k=6}^{100}(5+3k)$.

Possibilities:

(a) 15580

(b) 23

(c) 15155

(d) 15650

(e) 305

20. Evaluate the sum $\sum_{k=1}^{100}(4k^2-6k)$.

Possibilities:

(a) 39400

(b) 39398

(c) 1323100

(d) 5050

(e) -2

Some Formulas

1. Summation formulas:

$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

2. Areas:

(a) Triangle $A = \frac{bh}{2}$

(b) Circle $A = \pi r^2$

(c) Rectangle $A = lw$

(d) Trapezoid $A = \frac{h_1 + h_2}{2}\, b$

3. Volumes:

(a) Rectangular Solid $V = lwh$

(b) Sphere $V = \frac{4}{3}\pi r^3$

(c) Cylinder $V = \pi r^2 h$

(d) Cone $V = \frac{1}{3}\pi r^2 h$

4. Distance:

(a) Distance between (x_1, y_1) and (x_2, y_2)

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

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