King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Math 102
Exam I
Term 162
Wednesday 15/3/2017

EXAM COVER

Number of versions: 4
Number of questions: 20
Number of Answers: 5 per question

This exam was prepared using mcqs
For questions send an email to Dr. Ibrahim Al-Lehyani (iallehyani@kaau.edu.sa)

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Department of Mathematics and Statistics

Math 102
Exam I
Term 162
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Net Time Allowed: 120 minutes

MASTER VERSION

1. Using **three** rectangles and **midpoints**, the area under the graph of $f(x) = 3x - x^2$ from $x = 0$ to $x = 3$ is approximately equal to

(a) $\frac{19}{4}$

(b) $\frac{17}{4}$

(c) $\frac{17}{2}$

(d) 9

(e) $\frac{8}{3}$

2. $\int \left(\frac{1-x}{x}\right)^2 dx =$

(a) $-\frac{1}{x} - 2\ln|x| + x + C$

(b) $-\frac{1}{3}\left(\frac{1-x}{x}\right)^3 + C$

(c) $-\frac{1}{x} + x + C$

(d) $\frac{2}{x} + \ln|x| - x + C$

(e) $\frac{1}{x^2} + \frac{2}{x} + C$

3. $\displaystyle\int \frac{6}{x(\ln x)^4}\,dx =$

(a) $\dfrac{-2}{(\ln x)^3} + C$

(b) $\dfrac{-3}{(\ln x)^3} + C$

(c) $\dfrac{x}{(\ln x)^2} + C$

(d) $\dfrac{1}{3\,(\ln x)^3} + C$

(e) $\dfrac{6}{(\ln x)^2} + C$

4. $\displaystyle\int_0^1 x(\sqrt[3]{x} + 3x^2\,\sqrt{x})\,dx =$

(a) $\dfrac{23}{21}$

(b) $\dfrac{21}{5}$

(c) $\dfrac{1}{2}$

(d) $\dfrac{3}{7}$

(e) $\dfrac{8}{5}$

5. $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \cos\left(1+\frac{i}{n}\right)^2 =$

(a) $\int_1^2 \cos(x^2)\,dx$

(b) $\int_1^2 \cos(1+x^2)\,dx$

(c) $\int_1^2 \cos^2 x\,dx$

(d) $\int_0^1 \cos(x^2)\,dx$

(e) $\int_0^1 \cos(1+x^2)\,dx$

6. The **volume** of the solid obtained by rotating the region bounded by the curves $y = 2\sqrt{x}$, $y = 0$, $x = 2$ about the x-axis is

(a) 8π

(b) $\frac{5\pi}{2}$

(c) 3π

(d) 6π

(e) $\frac{\pi}{2}$

7. If $F(x) = \int_x^{x^2} e^{t^2}\, dt$ then $F'(x) =$

(a) $2x\, e^{x^4} - e^{x^2}$

(b) $e^{x^4} - e^{x^2}$

(c) $e^{x^4 - x^2}$

(d) $2\, e^{x^2} - e^{x}$

(e) $2\, e^{x^4} - x\, e^{x^2}$

8. $\displaystyle\int \frac{\tan\theta}{\sec\theta(\sec\theta - \cos\theta)}\, d\theta =$

(a) $\ln|\sin\,\theta| + C$

(b) $\ln|\sec\,\theta - \cos\,\theta| + C$

(c) $\sin\,\theta + \tan\,\theta + C$

(d) $-\tan\,\theta + \ln\,|\sin\,\theta| + C$

(e) $\cot\,\theta + \cos\,\theta + C$

9. An equation for the **tangent line** to the curve $y = \int_x^{\sqrt{3}} \sqrt{1+t^2}\ dt$ at the point with x-coordinate $\sqrt{3}$ is given by

(a) $y = -2x + 2\sqrt{3}$

(b) $y = 2x - 2\sqrt{3}$

(c) $y = \sqrt{3}x - 3$

(d) $y = 3x - 3\sqrt{3}$

(e) $y = -\sqrt{3}\,x + 2\sqrt{3}$

10. If $f(x) = \begin{cases} 2 + \sqrt{4 - x^2} & \text{if} \quad x < 2 \\ |x - 4| & \text{if} \quad x \geq 2 \end{cases}$,
then $\int_{-2}^{4} f(x)\,dx =$

(a) $2\,\pi + 10$

(b) $\pi - 6$

(c) $2\,\pi + 2$

(d) $\pi - 2$

(e) $6 + \dfrac{\pi}{2}$

11. The **area** of the region enclosed by the curves $y = |x|$ and $y = x^2 - 2$ is

(a) $\frac{20}{3}$

(b) $\frac{15}{16}$

(c) $\frac{25}{17}$

(d) $\frac{11}{5}$

(e) $\frac{17}{12}$

12. Using n subintervals with **right endpoints**, we get

$$\int_2^5 (x^2 - 4)\, dx =$$

(a) $\lim_{n\to\infty} \left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{2n^2}\right]$

(b) $\lim_{n\to\infty} \left[\frac{9(n+1)(2n+1)}{n^2} - 4n\right]$

(c) $\lim_{n\to\infty} \left[\frac{9(n+1)}{2n} - \frac{9(n+1)(2n+1)}{2n^2}\right]$

(d) $\lim_{n\to\infty} \left[\frac{12(n+1)}{n} + \frac{15(n+1)(2n+1)}{2n^2}\right]$

(e) $\lim_{n\to\infty} \left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{n^2}\right]$

13. The **volume** of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the line $x = -1$ is given by

(a) $\pi \int_0^1 [(1+\sqrt{y})^2 - (1+y)^2]\, dy$

(b) $\pi \int_0^1 [y - (1+y)^2]\, dy$

(c) $\pi \int_0^1 y - y^2\, dy$

(d) $\pi \int_0^1 [(x^2+1)^2 - (x+1)^2]\, dx$

(e) $\pi \int_0^1 (\sqrt{y} - y)\, dy$

14. $\int_{-1}^{1} \frac{\sin^3 t}{2+\sin^2 t}\, dt =$

(a) 0

(b) $\ln 2$

(c) $2\ln(2+\sin 1)$

(d) $-\ln(\sin 1)$

(e) $\ln\left(\frac{2+\sin 1}{2-\sin 1}\right)$

15. If $\int_{-5}^{7} f(x)dx = -17$, $\int_{-5}^{11} f(x)\,dx = 32$, and $\int_{8}^{7} f(x)\,dx = 5$, then $\int_{11}^{8} f(x)\,dx =$

(a) -54

(b) 19

(c) -60

(d) 44

(e) -50

16. The velocity $(in\, m/s)$ of a particle moving along a line is given by

$$v(t) = t^2 - 2$$

The **distance** traveled by the particle during the time interval $0 \le t \le 2$ is

(a) $\dfrac{8\sqrt{2}-4}{3}\, m$

(b) $\dfrac{4\sqrt{2}+2}{3}\, m$

(c) $\dfrac{4+\sqrt{2}}{3}\, m$

(d) $\dfrac{8-2\sqrt{2}}{3}\, m$

(e) $\dfrac{5-3\sqrt{2}}{3}\, m$

17. If f is a continuous function and

$$2 \leq f(x) \leq 5 \quad \text{for} \quad 3 \leq x \leq 9,$$

then which one of the following statements is in general **FALSE**:

(a) $\int_3^9 (1 - 2|f(x)|)\, dx \geq -10$

(b) $\int_3^9 (3 - f(x))\, dx \geq -12$

(c) $\int_3^9 |f(x)|\, dx \geq 12$

(d) $\int_3^9 -2\, f(x)\, dx \leq -24$

(e) $\int_3^9 (f(x))^2\, dx \geq 24$

18. $\int x^3 \sqrt{x^2+1}\, dx =$

(a) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{2}{3}\right) + C$

(b) $\frac{1}{3}(x^2+1)^{3/2}\left(x^2 - \frac{3}{5}\right) + C$

(c) $\frac{1}{5}(x^2+1)^5 + \frac{1}{3}\left(x^2+1\right)^3 + C$

(d) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{4}{3}\right) + C$

(e) $\frac{1}{3}(x^2+1)^{3/2}\left(\frac{3}{5}x^2 - 3\right) + C$

19. If $f(x) = x^{-1}\left[\cos\left(\frac{\pi}{4}\ln x\right)\right]^{-2}\left[4+5\tan\left(\frac{\pi}{4}\ln x\right)\right]^{-1/2}$, then $\int_1^e f(x)\,dx =$

(a) $\frac{8}{5\pi}$

(b) 4

(c) $\frac{6}{5\pi}$

(d) 4π

(e) $\frac{30}{\pi}$

20. The base of a solid is the triangular region with vertices $(0,0), (1,0)$, and $(0,1)$. If the cross sections of the solid perpendicular to the x-axis are **semi-circles**, then the **volume** of the solid is

(a) $\frac{\pi}{24}$

(b) $\frac{\pi}{12}$

(c) $\frac{\pi}{6}$

(d) $\frac{\pi}{4}$

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

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CODE 001 **Math 102** **CODE 001**

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ID: ________________________ Sec: ________________________.

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8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. $\displaystyle\int \left(\frac{1-x}{x}\right)^2 dx =$

(a) $-\dfrac{1}{x} + x + C$

(b) $\dfrac{2}{x} + \ln|x| - x + C$

(c) $-\dfrac{1}{3}\left(\dfrac{1-x}{x}\right)^3 + C$

(d) $-\dfrac{1}{x} - 2\,\ln\,|x| + x + C$

(e) $\dfrac{1}{x^2} + \dfrac{2}{x} + C$

2. $\displaystyle\int_0^1 x(\sqrt[3]{x} + 3x^2\sqrt{x})\,dx =$

(a) $\dfrac{21}{5}$

(b) $\dfrac{3}{7}$

(c) $\dfrac{8}{5}$

(d) $\dfrac{1}{2}$

(e) $\dfrac{23}{21}$

3. Using **three** rectangles and **midpoints**, the area under the graph of $f(x) = 3x - x^2$ from $x = 0$ to $x = 3$ is approximately equal to

(a) $\frac{8}{3}$

(b) $\frac{17}{2}$

(c) 9

(d) $\frac{19}{4}$

(e) $\frac{17}{4}$

4. $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \cos\left(1 + \frac{i}{n}\right)^2 =$

(a) $\int_0^1 \cos(1 + x^2)\, dx$

(b) $\int_0^1 \cos(x^2)\, dx$

(c) $\int_1^2 \cos^2 x\, dx$

(d) $\int_1^2 \cos(1 + x^2)\, dx$

(e) $\int_1^2 \cos(x^2)\, dx$

5. $\displaystyle\int \frac{6}{x(\ln x)^4}\,dx =$

(a) $\dfrac{-2}{(\ln x)^3} + C$

(b) $\dfrac{-3}{(\ln x)^3} + C$

(c) $\dfrac{6}{(\ln x)^2} + C$

(d) $\dfrac{x}{(\ln x)^2} + C$

(e) $\dfrac{1}{3\,(\ln x)^3} + C$

6. The **volume** of the solid obtained by rotating the region bounded by the curves $y = 2\sqrt{x}$, $y = 0$, $x = 2$ about the x-axis is

(a) $\dfrac{\pi}{2}$

(b) $6\,\pi$

(c) $\dfrac{5\pi}{2}$

(d) $3\,\pi$

(e) $8\,\pi$

7. $\displaystyle\int \frac{\tan\theta}{\sec\theta(\sec\theta - \cos\theta)}\, d\theta =$

(a) $\sin\,\theta + \tan\,\theta + C$

(b) $\cot\,\theta + \cos\,\theta + C$

(c) $\ln|\sec\,\theta - \cos\,\theta| + C$

(d) $\ln|\sin\,\theta| + C$

(e) $-\tan\,\theta + \ln\,|\sin\,\theta| + C$

8. If $F(x) = \displaystyle\int_x^{x^2} e^{t^2}\, dt$ then $F'(x) =$

(a) $e^{x^4} - e^{x^2}$

(b) $2\,e^{x^4} - x\,e^{x^2}$

(c) $2\,e^{x^2} - e^{x}$

(d) $e^{x^4 - x^2}$

(e) $2x\,e^{x^4} - e^{x^2}$

9. An equation for the **tangent line** to the curve $y = \int_x^{\sqrt{3}} \sqrt{1+t^2}\ dt$ at the point with x-coordinate $\sqrt{3}$ is given by

(a) $y = -\sqrt{3}\,x + 2\sqrt{3}$

(b) $y = 3x - 3\sqrt{3}$

(c) $y = -2x + 2\sqrt{3}$

(d) $y = \sqrt{3}x - 3$

(e) $y = 2x - 2\sqrt{3}$

10. If $f(x) = \begin{cases} 2 + \sqrt{4 - x^2} & \text{if} \quad x < 2 \\ |x - 4| & \text{if} \quad x \geq 2 \end{cases}$,
then $\int_{-2}^{4} f(x)\, dx =$

(a) $\pi - 2$

(b) $2\,\pi + 2$

(c) $2\,\pi + 10$

(d) $6 + \dfrac{\pi}{2}$

(e) $\pi - 6$

11. Using n subintervals with **right endpoints**, we get

$$\int_2^5 (x^2 - 4)\,dx =$$

(a) $\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{2n^2}\right]$

(b) $\lim_{n\to\infty}\left[\frac{9(n+1)(2n+1)}{n^2} - 4n\right]$

(c) $\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{n^2}\right]$

(d) $\lim_{n\to\infty}\left[\frac{12(n+1)}{n} + \frac{15(n+1)(2n+1)}{2n^2}\right]$

(e) $\lim_{n\to\infty}\left[\frac{9(n+1)}{2n} - \frac{9(n+1)(2n+1)}{2n^2}\right]$

12. The **volume** of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the line $x = -1$ is given by

(a) $\pi\int_0^1 [(x^2+1)^2 - (x+1)^2]\,dx$

(b) $\pi\int_0^1 (\sqrt{y} - y)\,dy$

(c) $\pi\int_0^1 [y - (1+y)^2]\,dy$

(d) $\pi\int_0^1 [(1+\sqrt{y})^2 - (1+y)^2]\,dy$

(e) $\pi\int_0^1 y - y^2\,dy$

13. $\displaystyle\int_{-1}^{1} \frac{\sin^3 t}{2+\sin^2 t}\, dt =$

(a) $-\ln(\sin 1)$

(b) $\ln\left(\dfrac{2+\sin 1}{2-\sin 1}\right)$

(c) $2\ln(2+\sin 1)$

(d) 0

(e) $\ln 2$

14. The **area** of the region enclosed by the curves $y=|x|$ and $y=x^2-2$ is

(a) $\dfrac{15}{16}$

(b) $\dfrac{17}{12}$

(c) $\dfrac{11}{5}$

(d) $\dfrac{25}{17}$

(e) $\dfrac{20}{3}$

15. If f is a continuous function and

$$2 \leq f(x) \leq 5 \quad \text{for} \quad 3 \leq x \leq 9,$$

then which one of the following statements is in general **FALSE**:

(a) $\int_3^9 (3 - f(x))\, dx \geq -12$

(b) $\int_3^9 (f(x))^2\, dx \geq 24$

(c) $\int_3^9 (1 - 2|f(x)|)\, dx \geq -10$

(d) $\int_3^9 |f(x)|\, dx \geq 12$

(e) $\int_3^9 -2\, f(x)\, dx \leq -24$

16. If $\int_{-5}^{7} f(x)dx = -17$, $\int_{-5}^{11} f(x)\, dx = 32$, and $\int_8^7 f(x)\, dx = 5$, then $\int_{11}^{8} f(x)\, dx =$

(a) -54

(b) 19

(c) -60

(d) 44

(e) -50

17. The velocity ($in\, m/s$) of a particle moving along a line is given by

$$v(t) = t^2 - 2$$

The **distance** traveled by the particle during the time interval $0 \leq t \leq 2$ is

(a) $\dfrac{4+\sqrt{2}}{3}\, m$

(b) $\dfrac{4\sqrt{2}+2}{3}\, m$

(c) $\dfrac{8\sqrt{2}-4}{3}\, m$

(d) $\dfrac{5-3\sqrt{2}}{3}\, m$

(e) $\dfrac{8-2\sqrt{2}}{3}\, m$

18. If $f(x) = x^{-1}\left[\cos\left(\frac{\pi}{4}\ln x\right)\right]^{-2}\left[4+5\tan\left(\frac{\pi}{4}\ln x\right)\right]^{-1/2}$, then $\int_1^e f(x)\,dx =$

(a) $\dfrac{6}{5\pi}$

(b) $\dfrac{8}{5\pi}$

(c) 4π

(d) $\dfrac{30}{\pi}$

(e) 4

19. $\int x^3 \sqrt{x^2+1}\, dx =$

(a) $\frac{1}{5}(x^2+1)^5 + \frac{1}{3}\left(x^2+1\right)^3 + C$

(b) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{4}{3}\right) + C$

(c) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{2}{3}\right) + C$

(d) $\frac{1}{3}(x^2+1)^{3/2}\left(x^2 - \frac{3}{5}\right) + C$

(e) $\frac{1}{3}(x^2+1)^{3/2}\left(\frac{3}{5}x^2 - 3\right) + C$

20. The base of a solid is the triangular region with vertices $(0,0)$, $(1,0)$, and $(0,1)$. If the cross sections of the solid perpendicular to the x-axis are **semi-circles**, then the **volume** of the solid is

(a) $\frac{\pi}{12}$

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

(c) $\frac{\pi}{6}$

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

(e) $\frac{\pi}{24}$

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
16	a	b	c	d	e	f
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19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

36	a	b	c	d	e	f
37	a	b	c	d	e	f
38	a	b	c	d	e	f
39	a	b	c	d	e	f
40	a	b	c	d	e	f
41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
46	a	b	c	d	e	f
47	a	b	c	d	e	f
48	a	b	c	d	e	f
49	a	b	c	d	e	f
50	a	b	c	d	e	f
51	a	b	c	d	e	f
52	a	b	c	d	e	f
53	a	b	c	d	e	f
54	a	b	c	d	e	f
55	a	b	c	d	e	f
56	a	b	c	d	e	f
57	a	b	c	d	e	f
58	a	b	c	d	e	f
59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
62	a	b	c	d	e	f
63	a	b	c	d	e	f
64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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CODE 002 **Math 102** **CODE 002**

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1. Using **three** rectangles and **midpoints**, the area under the graph of $f(x) = 3x - x^2$ from $x = 0$ to $x = 3$ is approximately equal to

(a) $\frac{8}{3}$

(b) 9

(c) $\frac{17}{2}$

(d) $\frac{19}{4}$

(e) $\frac{17}{4}$

2. The **volume** of the solid obtained by rotating the region bounded by the curves $y = 2\sqrt{x}$, $y = 0$, $x = 2$ about the x-axis is

(a) $\frac{5\pi}{2}$

(b) 6π

(c) 3π

(d) 8π

(e) $\frac{\pi}{2}$

3. $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \cos\left(1+\frac{i}{n}\right)^2 =$

(a) $\int_0^1 \cos(x^2)\,dx$

(b) $\int_1^2 \cos(x^2)\,dx$

(c) $\int_1^2 \cos(1+x^2)\,dx$

(d) $\int_0^1 \cos(1+x^2)\,dx$

(e) $\int_1^2 \cos^2 x\,dx$

4. $\int_0^1 x(\sqrt[3]{x} + 3x^2\sqrt{x})\,dx =$

(a) $\frac{23}{21}$

(b) $\frac{8}{5}$

(c) $\frac{21}{5}$

(d) $\frac{3}{7}$

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

5. $\displaystyle\int \left(\frac{1-x}{x}\right)^2 dx =$

(a) $\dfrac{2}{x} + \ln|x| - x + C$

(b) $\dfrac{1}{x^2} + \dfrac{2}{x} + C$

(c) $-\dfrac{1}{3}\left(\dfrac{1-x}{x}\right)^3 + C$

(d) $-\dfrac{1}{x} - 2\,\ln\,|x| + x + C$

(e) $-\dfrac{1}{x} + x + C$

6. $\displaystyle\int \frac{6}{x(\ln\,x)^4}\,dx =$

(a) $\dfrac{x}{(\ln\,x)^2} + C$

(b) $\dfrac{-2}{(\ln\,x)^3} + C$

(c) $\dfrac{6}{(\ln\,x)^2} + C$

(d) $\dfrac{-3}{(\ln\,x)^3} + C$

(e) $\dfrac{1}{3\,(\ln\,x)^3} + C$

7. $\displaystyle\int \frac{\tan\theta}{\sec\theta(\sec\theta - \cos\theta)}\, d\theta =$

(a) $\ln|\sin\,\theta| + C$

(b) $-\tan\,\theta + \ln\,|\sin\,\theta| + C$

(c) $\ln|\sec\,\theta - \cos\,\theta| + C$

(d) $\sin\,\theta + \tan\,\theta + C$

(e) $\cot\,\theta + \cos\,\theta + C$

8. If $f(x) = \begin{cases} 2 + \sqrt{4 - x^2} & \text{if} \quad x < 2 \\ |x - 4| & \text{if} \quad x \geq 2 \end{cases}$,
then $\int_{-2}^{4} f(x)\, dx =$

(a) $\pi - 2$

(b) $\pi - 6$

(c) $6 + \dfrac{\pi}{2}$

(d) $2\,\pi + 2$

(e) $2\,\pi + 10$

9. An equation for the **tangent line** to the curve $y = \int_x^{\sqrt{3}} \sqrt{1+t^2}\ dt$ at the point with x-coordinate $\sqrt{3}$ is given by

(a) $y = 3x - 3\sqrt{3}$

(b) $y = 2x - 2\sqrt{3}$

(c) $y = -2x + 2\sqrt{3}$

(d) $y = \sqrt{3}x - 3$

(e) $y = -\sqrt{3}\,x + 2\sqrt{3}$

10. If $F(x) = \int_x^{x^2} e^{t^2}\ dt$ then $F'(x) =$

(a) $2\,e^{x^4} - x\,e^{x^2}$

(b) $2\,e^{x^2} - e^{x}$

(c) $2x\,e^{x^4} - e^{x^2}$

(d) $e^{x^4 - x^2}$

(e) $e^{x^4} - e^{x^2}$

11. The **area** of the region enclosed by the curves $y = |x|$ and $y = x^2 - 2$ is

(a) $\dfrac{20}{3}$

(b) $\dfrac{11}{5}$

(c) $\dfrac{25}{17}$

(d) $\dfrac{15}{16}$

(e) $\dfrac{17}{12}$

12. Using n subintervals with **right endpoints**, we get

$$\int_2^5 (x^2 - 4)\,dx =$$

(a) $\displaystyle\lim_{n\to\infty}\left[\frac{9(n+1)}{2n} - \frac{9(n+1)(2n+1)}{2n^2}\right]$

(b) $\displaystyle\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{2n^2}\right]$

(c) $\displaystyle\lim_{n\to\infty}\left[\frac{12(n+1)}{n} + \frac{15(n+1)(2n+1)}{2n^2}\right]$

(d) $\displaystyle\lim_{n\to\infty}\left[\frac{9(n+1)(2n+1)}{n^2} - 4n\right]$

(e) $\displaystyle\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{n^2}\right]$

13. The **volume** of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the line $x = -1$ is given by

(a) $\pi \int_0^1 [(1 + \sqrt{y})^2 - (1 + y)^2] \, dy$

(b) $\pi \int_0^1 y - y^2 \, dy$

(c) $\pi \int_0^1 [y - (1 + y)^2] \, dy$

(d) $\pi \int_0^1 [(x^2 + 1)^2 - (x + 1)^2] \, dx$

(e) $\pi \int_0^1 (\sqrt{y} - y) \, dy$

14. $\int_{-1}^{1} \frac{\sin^3 t}{2 + \sin^2 t} \, dt =$

(a) $-\ln(\sin 1)$

(b) $\ln 2$

(c) $\ln \left(\frac{2 + \sin 1}{2 - \sin 1} \right)$

(d) $2 \ln(2 + \sin 1)$

(e) 0

15. The base of a solid is the triangular region with vertices $(0,0), (1,0)$, and $(0,1)$. If the cross sections of the solid perpendicular to the x-axis are **semi-circles**, then the **volume** of the solid is

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

(b) $\frac{\pi}{12}$

(c) $\frac{\pi}{6}$

(d) $\frac{\pi}{24}$

(e) $\frac{\pi}{4}$

16. If $\int_{-5}^{7} f(x)dx = -17$, $\int_{-5}^{11} f(x)\,dx = 32$, and $\int_{8}^{7} f(x)\,dx = 5$, then $\int_{11}^{8} f(x)\,dx =$

(a) 19

(b) -60

(c) -50

(d) 44

(e) -54

17. $\int x^3 \sqrt{x^2+1}\, dx =$

(a) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{4}{3}\right) + C$

(b) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{2}{3}\right) + C$

(c) $\frac{1}{5}(x^2+1)^5 + \frac{1}{3}\left(x^2+1\right)^3 + C$

(d) $\frac{1}{3}(x^2+1)^{3/2}\left(x^2 - \frac{3}{5}\right) + C$

(e) $\frac{1}{3}(x^2+1)^{3/2}\left(\frac{3}{5}x^2 - 3\right) + C$

18. The velocity $(in\, m/s)$ of a particle moving along a line is given by

$$v(t) = t^2 - 2$$

The **distance** traveled by the particle during the time interval $0 \le t \le 2$ is

(a) $\frac{8-2\sqrt{2}}{3}\, m$

(b) $\frac{5-3\sqrt{2}}{3}\, m$

(c) $\frac{4\sqrt{2}+2}{3}\, m$

(d) $\frac{8\sqrt{2}-4}{3}\, m$

(e) $\frac{4+\sqrt{2}}{3}\, m$

19. If $f(x) = x^{-1}\left[\cos\left(\frac{\pi}{4}\ln x\right)\right]^{-2}\left[4+5\tan\left(\frac{\pi}{4}\ln x\right)\right]^{-1/2}$, then $\int_1^e f(x)\,dx =$

(a) $\frac{30}{\pi}$

(b) 4π

(c) 4

(d) $\frac{6}{5\pi}$

(e) $\frac{8}{5\pi}$

20. If f is a continuous function and

$$2 \le f(x) \le 5 \quad \text{for} \quad 3 \le x \le 9,$$

then which one of the following statements is in general **FALSE**:

(a) $\int_3^9 |f(x)|\,dx \ge 12$

(b) $\int_3^9 (f(x))^2\,dx \ge 24$

(c) $\int_3^9 -2\,f(x)\,dx \le -24$

(d) $\int_3^9 (1-2|f(x)|)\,dx \ge -10$

(e) $\int_3^9 (3-f(x))\,dx \ge -12$

Name ....

ID .... Sec ....

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65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

CODE 003 | **Math 102** | **CODE 003**

Exam I
Term 162
Wednesday 15/3/2017
Net Time Allowed: 120 minutes

Name: ____

ID: ________________________ Sec: ________________________.

Check that this exam has 20 questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \cos\left(1+\frac{i}{n}\right)^2 =$

(a) $\int_0^1 \cos(1+x^2)\,dx$

(b) $\int_1^2 \cos^2 x\,dx$

(c) $\int_1^2 \cos(1+x^2)\,dx$

(d) $\int_0^1 \cos(x^2)\,dx$

(e) $\int_1^2 \cos(x^2)\,dx$

2. The **volume** of the solid obtained by rotating the region bounded by the curves $y = 2\sqrt{x}$, $y = 0$, $x = 2$ about the x-axis is

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

(b) 3π

(c) $\frac{5\pi}{2}$

(d) 6π

(e) 8π

3. Using **three** rectangles and **midpoints**, the area under the graph of $f(x) = 3x - x^2$ from $x = 0$ to $x = 3$ is approximately equal to

(a) 9

(b) $\frac{17}{4}$

(c) $\frac{8}{3}$

(d) $\frac{17}{2}$

(e) $\frac{19}{4}$

4. $\int_0^1 x(\sqrt[3]{x} + 3x^2\sqrt{x})\,dx =$

(a) $\frac{3}{7}$

(b) $\frac{8}{5}$

(c) $\frac{23}{21}$

(d) $\frac{21}{5}$

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

5. $\displaystyle\int \frac{6}{x(\ln x)^4}\,dx =$

(a) $\dfrac{x}{(\ln x)^2} + C$

(b) $\dfrac{1}{3\,(\ln x)^3} + C$

(c) $\dfrac{-3}{(\ln x)^3} + C$

(d) $\dfrac{6}{(\ln x)^2} + C$

(e) $\dfrac{-2}{(\ln x)^3} + C$

6. $\displaystyle\int \left(\frac{1-x}{x}\right)^2 dx =$

(a) $\dfrac{2}{x} + \ln|x| - x + C$

(b) $-\dfrac{1}{x} - 2\,\ln\,|x| + x + C$

(c) $-\dfrac{1}{3}\left(\dfrac{1-x}{x}\right)^3 + C$

(d) $-\dfrac{1}{x} + x + C$

(e) $\dfrac{1}{x^2} + \dfrac{2}{x} + C$

7. $\displaystyle\int \frac{\tan\theta}{\sec\theta(\sec\theta - \cos\theta)}\,d\theta =$

(a) $\cot\,\theta + \cos\,\theta + C$

(b) $\ln|\sin\,\theta| + C$

(c) $\ln|\sec\,\theta - \cos\,\theta| + C$

(d) $\sin\,\theta + \tan\,\theta + C$

(e) $-\tan\,\theta + \ln\,|\sin\,\theta| + C$

8. If $F(x) = \displaystyle\int_x^{x^2} e^{t^2}\,dt$ then $F'(x) =$

(a) $e^{x^4} - e^{x^2}$

(b) $2x\,e^{x^4} - e^{x^2}$

(c) $2\,e^{x^2} - e^{x}$

(d) $2\,e^{x^4} - x\,e^{x^2}$

(e) $e^{x^4 - x^2}$

9. An equation for the **tangent line** to the curve $y = \int_x^{\sqrt{3}} \sqrt{1+t^2}\ dt$ at the point with x-coordinate $\sqrt{3}$ is given by

(a) $y = -2x + 2\sqrt{3}$

(b) $y = -\sqrt{3}\,x + 2\sqrt{3}$

(c) $y = 2x - 2\sqrt{3}$

(d) $y = 3x - 3\sqrt{3}$

(e) $y = \sqrt{3}x - 3$

10. If $f(x) = \begin{cases} 2 + \sqrt{4 - x^2} & \text{if} \quad x < 2 \\ |x - 4| & \text{if} \quad x \geq 2 \end{cases}$, then $\int_{-2}^{4} f(x)\,dx =$

(a) $\pi - 6$

(b) $6 + \frac{\pi}{2}$

(c) $2\,\pi + 2$

(d) $\pi - 2$

(e) $2\,\pi + 10$

11. Using n subintervals with **right endpoints**, we get

$$\int_2^5 (x^2 - 4)\,dx =$$

(a) $\lim_{n\to\infty}\left[\frac{12(n+1)}{n} + \frac{15(n+1)(2n+1)}{2n^2}\right]$

(b) $\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{2n^2}\right]$

(c) $\lim_{n\to\infty}\left[\frac{9(n+1)}{2n} - \frac{9(n+1)(2n+1)}{2n^2}\right]$

(d) $\lim_{n\to\infty}\left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{n^2}\right]$

(e) $\lim_{n\to\infty}\left[\frac{9(n+1)(2n+1)}{n^2} - 4n\right]$

12. The **area** of the region enclosed by the curves $y = |x|$ and $y = x^2 - 2$ is

(a) $\frac{15}{16}$

(b) $\frac{11}{5}$

(c) $\frac{17}{12}$

(d) $\frac{25}{17}$

(e) $\frac{20}{3}$

13. The **volume** of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the line $x = -1$ is given by

(a) $\pi \int_0^1 [(x^2+1)^2 - (x+1)^2]\, dx$

(b) $\pi \int_0^1 y - y^2\, dy$

(c) $\pi \int_0^1 [y - (1+y)^2]\, dy$

(d) $\pi \int_0^1 [(1+\sqrt{y})^2 - (1+y)^2]\, dy$

(e) $\pi \int_0^1 (\sqrt{y} - y)\, dy$

14. $\int_{-1}^{1} \frac{\sin^3 t}{2+\sin^2 t}\, dt =$

(a) $2\ \ln(2 + \sin\ 1)$

(b) $-\ln(\sin\ 1)$

(c) $\ln\left(\frac{2+\sin\ 1}{2-\sin\ 1}\right)$

(d) 0

(e) $\ln\ 2$

15. If f is a continuous function and

$$2 \leq f(x) \leq 5 \quad \text{for} \quad 3 \leq x \leq 9,$$

then which one of the following statements is in general **FALSE**:

(a) $\int_3^9 (3 - f(x))\, dx \geq -12$

(b) $\int_3^9 (1 - 2|f(x)|)\, dx \geq -10$

(c) $\int_3^9 -2\, f(x)\, dx \leq -24$

(d) $\int_3^9 |f(x)|\, dx \geq 12$

(e) $\int_3^9 (f(x))^2\, dx \geq 24$

16. The base of a solid is the triangular region with vertices $(0,0), (1,0)$, and $(0,1)$. If the cross sections of the solid perpendicular to the x-axis are **semi-circles**, then the **volume** of the solid is

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

(b) $\frac{\pi}{12}$

(c) $\frac{\pi}{24}$

(d) $\frac{\pi}{4}$

(e) $\frac{\pi}{6}$

17. If $\int_{-5}^{7} f(x)dx = -17$, $\int_{-5}^{11} f(x)\,dx = 32$, and $\int_{8}^{7} f(x)\,dx = 5$, then $\int_{11}^{8} f(x)\,dx =$

(a) 19

(b) 44

(c) -50

(d) -54

(e) -60

18. If $f(x) = x^{-1}\left[\cos\left(\frac{\pi}{4}\ln x\right)\right]^{-2}\left[4+5\tan\left(\frac{\pi}{4}\ln x\right)\right]^{-1/2}$, then $\int_{1}^{e} f(x)\,dx =$

(a) $\frac{30}{\pi}$

(b) $\frac{8}{5\pi}$

(c) 4

(d) 4π

(e) $\frac{6}{5\pi}$

19. $\int x^3 \sqrt{x^2+1}\, dx =$

(a) $\frac{1}{3}(x^2+1)^{3/2}\left(x^2-\frac{3}{5}\right)+C$

(b) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2-\frac{4}{3}\right)+C$

(c) $\frac{1}{3}(x^2+1)^{3/2}\left(\frac{3}{5}x^2-3\right)+C$

(d) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2-\frac{2}{3}\right)+C$

(e) $\frac{1}{5}(x^2+1)^5+\frac{1}{3}\left(x^2+1\right)^3+C$

20. The velocity $(in\, m/s)$ of a particle moving along a line is given by

$$v(t) = t^2 - 2$$

The **distance** traveled by the particle during the time interval $0 \leq t \leq 2$ is

(a) $\frac{8\sqrt{2}-4}{3}\, m$

(b) $\frac{4\sqrt{2}+2}{3}\, m$

(c) $\frac{5-3\sqrt{2}}{3}\, m$

(d) $\frac{4+\sqrt{2}}{3}\, m$

(e) $\frac{8-2\sqrt{2}}{3}\, m$

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66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

CODE 004 **Math 102** CODE 004

Exam I

Term 162

Wednesday 15/3/2017

Net Time Allowed: 120 minutes

Name: ____

ID: ______________________ Sec: ______________________.

Check that this exam has 20 questions.

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8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. The **volume** of the solid obtained by rotating the region bounded by the curves $y = 2\sqrt{x}$, $y = 0$, $x = 2$ about the x-axis is

(a) 3π

(b) 8π

(c) $\frac{\pi}{2}$

(d) $\frac{5\pi}{2}$

(e) 6π

2. Using **three** rectangles and **midpoints**, the area under the graph of $f(x) = 3x - x^2$ from $x = 0$ to $x = 3$ is approximately equal to

(a) $\frac{19}{4}$

(b) $\frac{17}{4}$

(c) $\frac{8}{3}$

(d) $\frac{17}{2}$

(e) 9

3. $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \cos\left(1 + \frac{i}{n}\right)^2 =$

(a) $\int_0^1 \cos(x^2)\, dx$

(b) $\int_1^2 \cos(1 + x^2)\, dx$

(c) $\int_0^1 \cos(1 + x^2)\, dx$

(d) $\int_1^2 \cos(x^2)\, dx$

(e) $\int_1^2 \cos^2 x\, dx$

4. $\int_0^1 x(\sqrt[3]{x} + 3x^2\sqrt{x})\, dx =$

(a) $\frac{23}{21}$

(b) $\frac{8}{5}$

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

(d) $\frac{3}{7}$

(e) $\frac{21}{5}$

5. $\displaystyle\int \frac{6}{x(\ln\, x)^4}\, dx =$

(a) $\dfrac{6}{(\ln\, x)^2} + C$

(b) $\dfrac{-3}{(\ln\, x)^3} + C$

(c) $\dfrac{1}{3\,(\ln\, x)^3} + C$

(d) $\dfrac{-2}{(\ln\, x)^3} + C$

(e) $\dfrac{x}{(\ln\, x)^2} + C$

6. $\displaystyle\int \left(\frac{1-x}{x}\right)^2 dx =$

(a) $-\dfrac{1}{3}\left(\dfrac{1-x}{x}\right)^3 + C$

(b) $\dfrac{2}{x} + \ln|x| - x + C$

(c) $-\dfrac{1}{x} + x + C$

(d) $-\dfrac{1}{x} - 2\,\ln\,|x| + x + C$

(e) $\dfrac{1}{x^2} + \dfrac{2}{x} + C$

7. An equation for the **tangent line** to the curve $y = \int_x^{\sqrt{3}} \sqrt{1+t^2}\ dt$ at the point with x-coordinate $\sqrt{3}$ is given by

(a) $y = 3x - 3\sqrt{3}$

(b) $y = 2x - 2\sqrt{3}$

(c) $y = \sqrt{3}x - 3$

(d) $y = -\sqrt{3}\,x + 2\sqrt{3}$

(e) $y = -2x + 2\sqrt{3}$

8. $\int \frac{\tan\theta}{\sec\theta(\sec\theta - \cos\theta)}\, d\theta =$

(a) $\cot\,\theta + \cos\,\theta + C$

(b) $\ln|\sin\,\theta| + C$

(c) $\sin\,\theta + \tan\,\theta + C$

(d) $-\tan\,\theta + \ln\,|\sin\,\theta| + C$

(e) $\ln|\sec\,\theta - \cos\,\theta| + C$

9. If $F(x) = \int_{x}^{x^2} e^{t^2}\,dt$ then $F'(x) =$

(a) $e^{x^4} - e^{x^2}$

(b) $2\,e^{x^4} - x\,e^{x^2}$

(c) $2x\,e^{x^4} - e^{x^2}$

(d) $e^{x^4 - x^2}$

(e) $2\,e^{x^2} - e^{x}$

10. If $f(x) = \begin{cases} 2 + \sqrt{4 - x^2} & \text{if} \quad x < 2 \\ |x - 4| & \text{if} \quad x \geq 2 \end{cases}$,

then $\int_{-2}^{4} f(x)\,dx =$

(a) $2\,\pi + 10$

(b) $\pi - 2$

(c) $2\,\pi + 2$

(d) $\pi - 6$

(e) $6 + \dfrac{\pi}{2}$

11. The **area** of the region enclosed by the curves $y = |x|$ and $y = x^2 - 2$ is

(a) $\dfrac{15}{16}$

(b) $\dfrac{20}{3}$

(c) $\dfrac{25}{17}$

(d) $\dfrac{11}{5}$

(e) $\dfrac{17}{12}$

12. Using n subintervals with **right endpoints**, we get

$$\int_2^5 (x^2 - 4)\, dx =$$

(a) $\displaystyle\lim_{n\to\infty} \left[\frac{9(n+1)}{2n} - \frac{9(n+1)(2n+1)}{2n^2}\right]$

(b) $\displaystyle\lim_{n\to\infty} \left[\frac{12(n+1)}{n} + \frac{15(n+1)(2n+1)}{2n^2}\right]$

(c) $\displaystyle\lim_{n\to\infty} \left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{n^2}\right]$

(d) $\displaystyle\lim_{n\to\infty} \left[\frac{18(n+1)}{n} + \frac{9(n+1)(2n+1)}{2n^2}\right]$

(e) $\displaystyle\lim_{n\to\infty} \left[\frac{9(n+1)(2n+1)}{n^2} - 4n\right]$

13. $\int_{-1}^{1} \frac{\sin^3 t}{2+\sin^2 t}\, dt =$

(a) $-\ln(\sin 1)$

(b) $\ln 2$

(c) $2\ln(2+\sin 1)$

(d) 0

(e) $\ln\left(\frac{2+\sin 1}{2-\sin 1}\right)$

14. The **volume** of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the line $x = -1$ is given by

(a) $\pi \int_0^1 y - y^2\, dy$

(b) $\pi \int_0^1 [(x^2+1)^2 - (x+1)^2]\, dx$

(c) $\pi \int_0^1 [(1+\sqrt{y})^2 - (1+y)^2]\, dy$

(d) $\pi \int_0^1 [y - (1+y)^2]\, dy$

(e) $\pi \int_0^1 (\sqrt{y} - y)\, dy$

15. $\int x^3 \sqrt{x^2+1}\,dx =$

(a) $\frac{1}{5}(x^2+1)^5 + \frac{1}{3}\left(x^2+1\right)^3 + C$

(b) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{4}{3}\right) + C$

(c) $\frac{1}{3}(x^2+1)^{3/2}\left(x^2 - \frac{3}{5}\right) + C$

(d) $\frac{1}{3}(x^2+1)^{3/2}\left(\frac{3}{5}x^2 - 3\right) + C$

(e) $\frac{1}{5}(x^2+1)^{3/2}\left(x^2 - \frac{2}{3}\right) + C$

16. If $f(x) = x^{-1}\left[\cos\left(\frac{\pi}{4}\ln x\right)\right]^{-2}\left[4+5\tan\left(\frac{\pi}{4}\ln x\right)\right]^{-1/2}$, then $\int_1^e f(x)\,dx =$

(a) $\frac{30}{\pi}$

(b) $\frac{6}{5\pi}$

(c) 4π

(d) 4

(e) $\frac{8}{5\pi}$

17. The base of a solid is the triangular region with vertices $(0,0), (1,0)$, and $(0,1)$. If the cross sections of the solid perpendicular to the x-axis are **semi-circles**, then the **volume** of the solid is

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

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

(c) $\frac{\pi}{24}$

(d) $\frac{\pi}{12}$

(e) $\frac{\pi}{6}$

18. If f is a continuous function and

$$2 \leq f(x) \leq 5 \quad \text{for} \quad 3 \leq x \leq 9,$$

then which one of the following statements is in general **FALSE**:

(a) $\int_3^9 (3 - f(x))\, dx \geq -12$

(b) $\int_3^9 -2\, f(x)\, dx \leq -24$

(c) $\int_3^9 |f(x)|\, dx \geq 12$

(d) $\int_3^9 (f(x))^2\, dx \geq 24$

(e) $\int_3^9 (1 - 2|f(x)|)\, dx \geq -10$

19. If $\int_{-5}^{7} f(x)dx = -17$, $\int_{-5}^{11} f(x)\,dx = 32$, and $\int_{8}^{7} f(x)\,dx = 5$, then $\int_{11}^{8} f(x)\,dx =$

(a) -60

(b) 19

(c) -54

(d) -50

(e) 44

20. The velocity $(in\, m/s)$ of a particle moving along a line is given by

$$v(t) = t^2 - 2$$

The **distance** traveled by the particle during the time interval $0 \le t \le 2$ is

(a) $\dfrac{8 - 2\sqrt{2}}{3}\,m$

(b) $\dfrac{4\sqrt{2} + 2}{3}\,m$

(c) $\dfrac{4 + \sqrt{2}}{3}\,m$

(d) $\dfrac{8\sqrt{2} - 4}{3}\,m$

(e) $\dfrac{5 - 3\sqrt{2}}{3}\,m$

Name ....
ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
16	a	b	c	d	e	f
17	a	b	c	d	e	f
18	a	b	c	d	e	f
19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

36	a	b	c	d	e	f
37	a	b	c	d	e	f
38	a	b	c	d	e	f
39	a	b	c	d	e	f
40	a	b	c	d	e	f
41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
46	a	b	c	d	e	f
47	a	b	c	d	e	f
48	a	b	c	d	e	f
49	a	b	c	d	e	f
50	a	b	c	d	e	f
51	a	b	c	d	e	f
52	a	b	c	d	e	f
53	a	b	c	d	e	f
54	a	b	c	d	e	f
55	a	b	c	d	e	f
56	a	b	c	d	e	f
57	a	b	c	d	e	f
58	a	b	c	d	e	f
59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
62	a	b	c	d	e	f
63	a	b	c	d	e	f
64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

Q	MM	V1	V2	V3	V4
1	a	d	d	e	b
2	a	e	d	e	a
3	a	d	b	e	d
4	a	e	a	c	a
5	a	a	d	e	d
6	a	e	b	b	d
7	a	d	a	b	e
8	a	e	e	b	b
9	a	c	c	a	c
10	a	c	c	e	a
11	a	a	a	b	b
12	a	d	b	e	d
13	a	d	a	d	d
14	a	e	e	d	c
15	a	c	d	b	e
16	a	a	e	c	e
17	a	c	b	d	c
18	a	b	d	b	e
19	a	c	e	d	c
20	a	e	d	a	d

Answer Counts

V	a	b	c	d	e
1	1	4	2	7	6
2	4	4	2	6	4
3	6	3	3	5	3
4	3	7	1	7	2