Name: _____

Section: _____

Math 10560, Final Review
May 20, 3000

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- Please turn off all cellphones and electronic devices.
- Calculators are NOT allowed
- The quiz lasts for 50 min.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
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10.	(a)	(b)	(c)	(d)	(e)
11.	(a)	(b)	(c)	(d)	(e)
12.	(a)	(b)	(c)	(d)	(e)
13.	(a)	(b)	(c)	(d)	(e)
14.	(a)	(b)	(c)	(d)	(e)
15.	(a)	(b)	(c)	(d)	(e)

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Multiple Choice

1.(6 pts.) What can be said about the integrals

$$(i) \int_0^1 \frac{e^x}{x^2}\, dx;$$

$$(ii) \int_1^\infty \frac{\cos^2 x}{x^2}\, dx?$$

(a) both (i) and (ii) converge

(b) (i) diverges and (ii) converges

(c) (i) converges and (ii) diverges

(d) both (i) and (ii) diverge

(e) neither integral (i) nor (ii) is improper

2.(6 pts.) The point $\left(2, \frac{7\pi}{3}\right)$ in polar coordinates corresponds to which point below in Cartesian coordinates?

(a) $(\sqrt{3}, 1)$

(b) Since $\frac{7\pi}{3} > 2\pi$, there is no such point

(c) $(1, \sqrt{3})$

(d) $(-1, \sqrt{3})$

(e) $(-\sqrt{3}, 1)$

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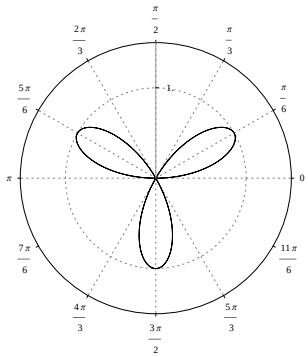
3.(6 pts.) Which integral below gives the area inside the polar curve $r = \sin(3\theta)$?



(a) $\dfrac{1}{2}\displaystyle\int_0^{\pi} \sqrt{\sin^2(3\theta) + 9\cos^2(3\theta)}\ d\theta$

(b) $\dfrac{1}{2}\displaystyle\int_{\pi/6}^{\pi/3} \sin^2(3\theta)\ d\theta$

(c) $\dfrac{1}{2}\displaystyle\int_0^{\pi} \sin^2(3\theta)\ d\theta$

(d) $\dfrac{1}{2}\displaystyle\int_0^{2\pi} \sin^2(3\theta)\ d\theta$

(e) $\dfrac{1}{2}\displaystyle\int_0^{2\pi} \sqrt{\sin^2(3\theta) + 9\cos^2(3\theta)}\ d\theta$

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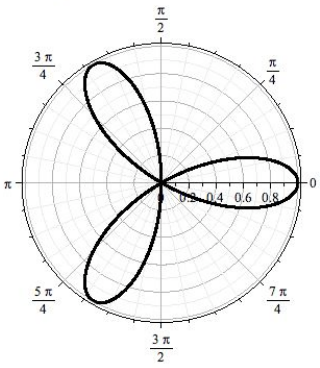
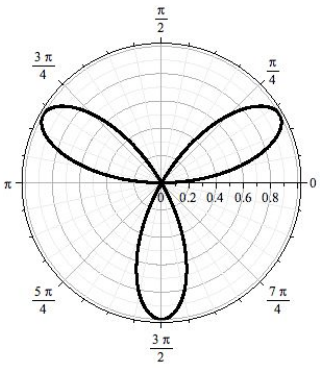
4.(6 pts.) Which of the following gives the graph of the curve described by the polar equation

$$r = \cos(3\theta).$$

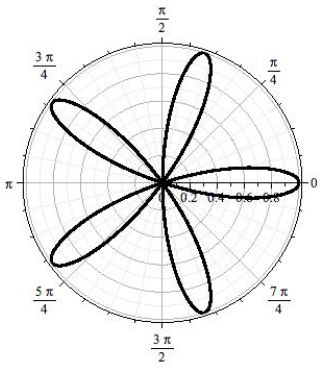
I

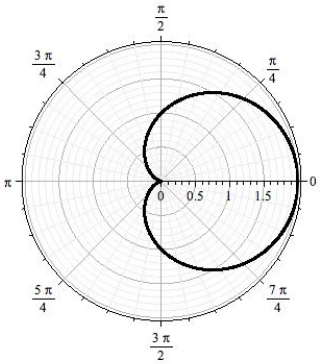


II

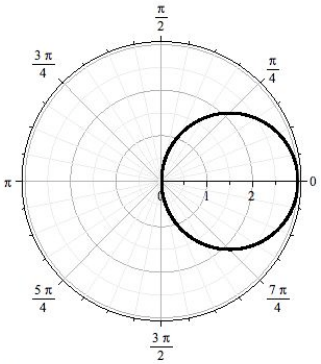


III





IV



V

(a) V (b) IV (c) II (d) I (e) III

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5.(6 pts.) The function $f(x) = x + \sqrt{x}$ is one-to-one. Find the tangent line to the inverse function $f^{-1}(x)$ at the point $x = 2$.

(a) $y - 2 = \frac{3}{2}(x - 1)$

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

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

(d) $y - 1 = \frac{2}{3}(x - 2)$

(e) $y - 1 = \frac{3}{2}(x - 2)$

6.(6 pts.) Compute the integral

$$\int_0^1 4 \tan^{-1}(x) dx \ .$$

(a) $\pi - \ln 4$

(b) $2\pi - \ln 2$

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

(d) $\pi - 1$

(e) 0

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7.(6 pts.) Find $\int_0^{\frac{\pi}{4}} \tan^2 x \, \sec^4 x \, dx$.

(a) $\frac{2}{5}$ (b) $\frac{2}{3}$ (c) $\frac{8}{15}$ (d) $\frac{2}{15}$ (e) 1

8.(6 pts.) Which equation below is the partial fraction decomposition of the rational function

$$\frac{5x^2 - 10x - 8}{(x-2)(x^2+4)}.$$

(a) $\frac{-1}{x-2} + \frac{6x+2}{x^2+4}$

(b) $\frac{-1}{x-2} + \frac{x+2}{x^2+4}$

(c) $\frac{5}{x-2} + \frac{x+1}{x^2+4}$

(d) $\frac{5}{x-2} + \frac{6x+1}{x^2+4}$

(e) $\frac{-1}{x-2} + \frac{2}{x^2+4}$

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9.(6 pts.) The length of the curve $y = \dfrac{x^3}{6} + \dfrac{1}{2x}, \quad \dfrac{1}{2} \leq x \leq 1$, is given by:

(a) $\dfrac{1}{2}\displaystyle\int_{1/2}^{1} \sqrt{1 + (x + x^{-1})^2}\,dx$

(b) $\dfrac{1}{2}\displaystyle\int_{1/2}^{1} \sqrt{(x^2 + x^{-2})}\,dx$

(c) $\dfrac{1}{2}\displaystyle\int_{1/2}^{1} (x^2 + x^{-2})\,dx$

(d) $\dfrac{1}{2}\displaystyle\int_{1/2}^{1} \sqrt{1 + (x^2 + x^{-2})^2}\,dx$

(e) $\dfrac{1}{2}\displaystyle\int_{1/2}^{1} (x + x^{-1})\,dx$

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10.(6 pts.) Find the area enclosed by the following cycloid and the x-axis:

$$x(t) = t - \sin t \qquad y(t) = 1 - \cos t \qquad 0 \leq t \leq 2\pi.$$

(a) 2π (b) π (c) $\dfrac{\pi^2}{3}$

(d) 3π (e) π^2

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11.(6 pts.) Let C be a constant. Which of the following is a solution to the differential equation $y' = x + \frac{1}{x}y$?

(a) $y = C$ (b) $y = x + C$ (c) $y = \frac{x + C}{x}$

(d) $y = x(x + C)$ (e) $y = Cx^2$

12.(6 pts.) Use Simpson's rule with step size $\Delta x = 1$ to appoximate the integral $\int_0^4 f(x)dx$ where a table of values for the function $f(x)$ is given below.

x	0	1	2	3	4
$f(x)$	2	1	2	3	5

(a) 9 (b) 11 (c) 9.5 (d) 8 (e) 10.4

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13.(6 pts.) Which one of the following statements is TRUE?

(a) $\sum_{n=1}^{\infty} \frac{1}{((\sin n)^2+1)\,n}$ is divergent by ratio test.

(b) $\sum_{n=1}^{\infty} \frac{1}{((\sin n)^2+1)\,n}$ is absolutely convergent by root test.

(c) $\sum_{n=1}^{\infty} \frac{1}{((\sin n)^2+1)\,n}$ is divergent by comparison test.

(d) $\sum_{n=1}^{\infty} \frac{1}{((\sin n)^2+1)\,n}$ is absolutely convergent by ratio test.

(e) none of the above

14.(6 pts.) Which of the following statements is TRUE?

(a) $\sum_{n=1}^{\infty} \frac{(-1)^n(\sqrt{n}+1)}{n}$ diverges.

(b) $\sum_{n=1}^{\infty} \frac{(-1)^n(\sqrt{n}+1)}{n}$ converges conditionally.

(c) $\sum_{n=1}^{\infty} \frac{(-1)^n 3^n}{5^n}$ diverges by divergence test.

(d) $\sum_{n=1}^{\infty} \frac{(-1)^n(\sqrt{n}+1)}{n}$ converges absolutely.

(e) $\sum_{n=1}^{\infty} \frac{(-1)^n 3^n}{5^n}$ converges conditionally.

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15.(6 pts.) Which line below is the tangent line to the parameterized curve $x = t - \cos t$, $y = t + \sin t$ when $t = 0$?

(a) $x = -1$, a vertical tangent

(b) $y = \dfrac{1 + \cos t}{1 + \sin t}\,(x + 1)$

(c) $y = 2x + 2$

(d) $y = \dfrac{\pi}{2}x + \dfrac{\pi}{2}$

(e) $y = \dfrac{t + \sin t}{t - \cos t}\,(x + 1)$

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Section: ANSWERS

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