This review, produced by the Broward Teaching Center, contains a collection of questions which are representative of the type you may encounter on the exam. Other resources made available by the Teaching Center include:

- Walk-In tutoring at Broward Hall
- Private-Appointment, one-on-one tutoring at Broward Hall
- Walk-In tutoring in LIT 215
- Supplemental Instruction
- Video resources for Math and Science classes at UF
- Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
MAC2312 Exam 3 Review

1. The length of the parametric curve \( x = e^t - t, \ y = 4e^{t/2}, \ t \in [-8, 3] \) is given by the integral:

A. \( \int_{-8}^{3} (e^t + 1) \, dt \)  
B. \( \int_{-8}^{3} 2(e^t + 1) \, dt \)  
C. \( \int_{-8}^{3} 4(e^t + 1) \, dt \)  
D. \( \int_{-8}^{3} 2(e^t - 1) \, dt \)  
E. \( \int_{-8}^{3} \sqrt{2}(e^t + 1) \, dt \)

2. The polar equation \( r = 2 \cos \theta \) can be expressed as:

A. \((x - 1)^2 + (y + 1)^2 = 1\)  
B. \((x + 1)^2 + (y - 1)^2 = 1\)  
C. \((x - 1)^2 + y^2 = 1\)  
D. \((x - 1)^2 + (y - 1)^2 = 4\)  
E. \((x + 1)^2 + (y + 1)^2 = 2\)

3. Graph the following polar equation: \( r = 5 - 4 \cos \theta \)

4. Calculate the Taylor series representation of \( e^{3x} \) centered at 3.

A. \( e^9 \sum_{n=0}^{\infty} \frac{3^n(x-3)^n}{n!} \)  
B. \( \sum_{n=0}^{\infty} \frac{3^n(x-3)^n}{n!} \)  
C. \( e^9 \sum_{n=0}^{\infty} \frac{(x-3)^n}{n!} \)  
D. \( \sum_{n=0}^{\infty} \frac{3^n x^n}{n!} \)  
E. \( \sum_{n=0}^{\infty} e^9 \frac{3^n(x-3)^n}{n} \)

5. Write the Cartesian point \((2, \sqrt{12})\) in polar coordinates.

A. \((4, \frac{\pi}{3})\)  
B. \((4, \frac{\pi}{6})\)  
C. \((\frac{\pi}{6}, 2)\)  
D. \((\frac{\pi}{3}, 2)\)  
E. \((2, \frac{\pi}{3})\)
6. Consider \( x = t^3 - t^2 + t \) and \( y = 3e^t \). Calculate the slope and the sign (positive or negative) of the second derivative at the point \((0, 3)\).

A. Slope = 3, second derivative is negative
B. Slope = 1, second derivative is negative
C. Slope = \( \frac{1}{3} \), second derivative is negative
D. Slope = \( \frac{1}{3} \), second derivative is positive
E. Slope = 3, second derivative is positive

7. Which of the following describes the graph of the parametric curve given by the equations below?

\[
\begin{align*}
x &= 2 \sin(t) \\
y &= \cos(t)
\end{align*}
\quad 0 \leq t \leq 2\pi
\]

A. An ellipse drawn clockwise
B. A circle drawn counterclockwise
C. A circle drawn clockwise
D. An ellipse drawn counterclockwise
E. None of the others

8. Find a Taylor series for \( \ln(1 + 4x) \) centered at 1.

\[
\begin{align*}
A. \ln 5 + \sum_{n=1}^{\infty} \frac{(-1)^{n+1}4^n(x - 1)^n}{5^n n} \\
B. \ln 5 + \sum_{n=1}^{\infty} \frac{(-1)^{n+1}4^n(x - 1)^n}{5^n} \\
C. \ln 5 + \sum_{n=1}^{\infty} \frac{(-1)^{n+1}4^n(x - 1)^n}{5^n n!} \\
D. \sum_{n=1}^{\infty} \frac{(-1)^{n+1}4^n x^n}{n} \\
E. \sum_{n=0}^{\infty} \frac{(-1)^{n+1}4^n(x - 1)^n}{5^n n!}
\end{align*}
\]
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9. Find the point \((x, y)\) where the tangent line to the curve \(c(t) = (3t^2 - 2, 3t^2 + 2t)\) is horizontal.
   A. \((-14/9, 52/9)\)  
   B. \((10, 16)\)  
   C. \((-5/3, -1/3)\)  
   D. \((-23/12, -1/4)\)  
   E. DNE

10. Graph the following:
   (a) \(r = \cos(3\theta)\)
   (b) \(r = \sin(2\theta)\)

11. Find the Maclaurin series of \(f(x) = \frac{x}{(3 - x)^2}\) and determine its radius of convergence \(R\).
   A. \(f(x) = \sum_{n=1}^{\infty} \frac{nx^n}{3^{n+1}}\) and \(R = \frac{1}{3}\)  
   B. \(f(x) = \sum_{n=1}^{\infty} \frac{-nx^n}{3^{n+1}}\) and \(R = \frac{1}{3}\)  
   C. \(f(x) = \sum_{n=1}^{\infty} \frac{nx^n}{3^{n+1}}\) and \(R = 3\)  
   D. \(f(x) = \sum_{n=1}^{\infty} \frac{-nx^n}{3^{n+1}}\) and \(R = 3\)  
   E. \(f(x) = \sum_{n=1}^{\infty} \frac{-nx^{n-1}}{3^{n+1}}\) and \(R = \frac{1}{3}\)

12. Suppose that \(\sum c_n(x - 2)^n\) converges for \(x = 4\) and diverges for \(x = -2\). Which of the following must be correct?
   A. \(\sum c_n(-2)^n\) converges  
   B. \(\sum c_n4^n\) diverges  
   C. \(\sum c_n3^n\) converges  
   D. \(\sum c_n(-1)^n\) converges  
   E. \(\sum c_n \left(\frac{5}{2}\right)^n\) diverges

13. If \(f(x) = \sin^2(x)\), find \(f^{(102)}(0)\).
   A. \(-\frac{102!}{205!}\)  
   B. \(\frac{102!}{205!}\)  
   C. \(-\frac{102!}{51!}\)  
   D. \(-\frac{102!}{205!}\)  
   E. \(\frac{205!}{102!}\)
14. Set up an integral for the area of the region that lies inside $r = \sqrt{3} \sin \theta$ and outside $r = \cos \theta$.

A. Area $= \int_{\pi/3}^{2\pi} \frac{1}{2} (\sqrt{3} \sin \theta)^2 d\theta - \int_{\pi/3}^{\pi} \frac{1}{2} (\cos \theta)^2 d\theta$

B. Area $= \int_{\pi/6}^{2\pi} \frac{1}{2} (\sqrt{3} \sin \theta)^2 d\theta - \int_{\pi/6}^{\pi/2} \frac{1}{2} (\cos \theta)^2 d\theta$

C. Area $= \int_{\pi/6}^{2\pi} \frac{1}{2} (\sqrt{3} \sin \theta)^2 d\theta - \int_{\pi/6}^{\pi} \frac{1}{2} (\cos \theta)^2 d\theta$

D. Area $= \int_{\pi/6}^{2\pi} \frac{1}{2} (\sqrt{3} \sin \theta)^2 d\theta - \int_{\pi/6}^{\pi/2} \frac{1}{2} (\cos \theta)^2 d\theta$

E. Area $= \int_{\pi/3}^{2\pi} \frac{1}{2} (\sqrt{3} \sin \theta)^2 d\theta - \int_{\pi/3}^{\pi/2} \frac{1}{2} (\cos \theta)^2 d\theta$

15. Graph the following polar equation: $r = 2 - 2 \sin \theta$