MA 166 Midterm 2, Test number 26, October 2015

1. $\lim_{n\to\infty} \dfrac{n^2+1}{e^n+1} =$

   A. 0

   B. $1/2$

   C. $1/e$

   D. $2/e$

   E. The sequence is divergent.

2. The partial fraction decomposition of $\dfrac{1}{x^3+x}$ is

   A. $\dfrac{1}{x^3} - \dfrac{1}{x}$

   B. $\dfrac{1}{x^3} + \dfrac{1}{2x^2} - \dfrac{1}{2x}$

   C. $\dfrac{1}{x} - \dfrac{x}{1+x^2}$

   D. $\dfrac{2}{1+x^2} - \dfrac{3}{x}$

   E. $\dfrac{1}{x} - \dfrac{2}{x^2} + \dfrac{3}{1+x^2}$

3. $\int_0^1 \sqrt{3+2x-x^2}\,dx =$

A. 1

B. 2

C. 2π

D. $\dfrac{\pi}{2}$

E. $\dfrac{\sqrt{3}}{2}+\dfrac{\pi}{3}$

4. Which statement is true, concerning the series

$$(1) \quad \sum_{n=1}^{\infty} \frac{1}{n+2} \quad \text{and} \quad (2) \quad \sum_{n=1}^{\infty} \frac{n^2}{2n^3-1} \quad ?$$

A. Both converge.

B. (1) converges, (2) diverges.

C. (1) diverges, (2) converges.

D. Both diverge.

E. None of A,B,C,D is true.

5. A plate is bounded by the the x axis and the lines $y = 3x$, $x = 1$. If its density is $\rho = 2$, its moment M_y about the y axis is

   A. 1

   B. 2

   C. 3

   D. 4

   E. 6

6. Suppose the *derivative* of a function g is $g'(x) = \sqrt{2\sin x + \sin^2 x}$. Find the length of the curve $y = g(x)$, $0 \leq x \leq \pi$.

   A. 2

   B. $\pi - 2$

   C. 3

   D. $\pi + 2$

   E. $3 - \pi/2$

7. To evaluate $\int \frac{4x^2\,dx}{x+\sqrt{x+1}}$, your first step will be to substitute

A. $x = \sec^2 t$

B. $x = \tan t$

C. $x^2 = t$

D. $x + 1 = t^2$

E. $x + \sqrt{x+1} = t$

8. $\int_{-\infty}^{1} xe^{x/2}\,dx =$

A. $-2\sqrt{e}$

B. $\sqrt{e}$

C. $e^2 - 1$

D. e

E. The integral is divergent.

9. $\displaystyle\int_0^{1/2} \frac{4t-1}{1+4t^2}\,dt =$

A. $\ln\sqrt{2}+\dfrac{\pi}{4}$

B. $\ln 2-\dfrac{\pi}{6}$

C. $\ln 2+\dfrac{2\pi}{3}$

D. $\ln\sqrt{2}-\dfrac{\pi}{8}$

E. $\ln 2+\dfrac{2\pi}{3}$

10. $\displaystyle\lim_{p\to\infty} \frac{p\sin p}{p^2+p+2} =$

A. 1

B. 0

C. -1

D. $1/4$

E. The sequence diverges.

11. $\sum_{k=1}^{\infty} \frac{2^k}{3^{k+1}} =$

A. 2/3

B. 1/2

C. 2/9

D. 3/4

E. 4/3

12. Some of the following four statements concerning a series $\sum_{n=1}^{\infty} b_n$ must be false, no matter what the series is. Which?

I. The sequence $\{b_n\}$ and the series $\sum_{n=1}^{\infty} b_n$ both converge.

II. The sequence $\{b_n\}$ converges but series $\sum_{n=1}^{\infty} b_n$ diverges.

III. The sequence $\{b_n\}$ diverges but series $\sum_{n=1}^{\infty} b_n$ converges.

IV. The sequence $\{b_n\}$ and series $\sum_{n=1}^{\infty} b_n$ both diverge.

A. I. must be false.

B. II. must be false.

C. III. must be false.

D. IV. must be false.

E. Both II. and III. must be false.