AP Calculus BC, 1st Semester Review
Multiple Choice Set #3
"BC" topics not on "AB"

* denotes that a graphing calculator may be used

1. *The solution of the differential equation $\frac{dy}{dx}=-\frac{x^2}{y}$ contains the point $(3,-2)$. Use Euler's Method with $\Delta x=-0.3$ to approximate y when $x = 2.7$.
   a. -2.98
   b. -3.00
   c. -3.08
   d. -3.25
   e. -3.35

2. $\int x\sin x\,dx=$
   a. $-\frac{1}{2}x^2\cos x+C$
   b. $-x\cos x+C$
   c. $x\cos x-\sin x+C$
   d. $-x\cos x+\sin x+C$
   e. $-x\cos x-\sin x+C$

3. If f is a differentiable function such that the slope of the graph of f at each point $(x,f(x))$ is $\sqrt{x^2-2x}$, then the length of the graph of f between $(0,f(0))$ and $(2,f(2))$ is
   a. 1/2
   b. 2/3
   c. 3/4
   d. 1
   e. 2

4. *The base of a solid is enclosed by the graph of $y=3(x-2)^2$ and the coordinate axes. If every cross section perpendicular to the x-axis is a square, then the volume of the solid is
   a. 8.0
   b. 19.2
   c. 24.0
   d. 25.6
   e. 57.6

5. Let the repeating decimal 0.242424… = N. Which statement is true?
   I. $N=\sum_{k=1}^{\infty}24\left(\frac{1}{100}\right)^k$
   II. $N=\frac{24}{1-100^{-2}}$
   III. $N=\frac{8}{33}$
   a. I only
   b. II only
   c. III only
   d. I and II
   e. I and III

6. What is the sum of the series $\frac{3}{2}-\frac{3}{8}+\frac{3}{32}-\frac{3}{128}+\ldots$?
   a. 6/7
   b. 9/8
   c. 6/5
   d. 15/8
   e. 2

7. $\int\frac{dx}{2x^2+3x+1}=$
   a. $2\ln\left|\frac{2x+1}{x+1}\right|+C$
   b. $\ln\left|\frac{(2x+1)^2}{x+1}\right|+C$
   c. $\ln\left|\frac{x+1}{2x+1}\right|+C$
   d. $\ln\left|\frac{2x+1}{x+1}\right|+C$
   e. $\ln\left|(x+1)(2x+1)\right|+C$

8. If the length of the curve $y=f(x)$ from $x=a$ to $x=b$ is given by $L=\int_a^b\sqrt{e^{2x}+2e^x+2}\,dx$, then $f(x)$ may be
   a. $2e^{2x}+2e^x$
   b. $\frac{1}{2}e^{2x}+2e^x+2x$
   c. e^x-x+3
   d. e^x+1
   e. e^x+x-2

Answers

1.	E	2.	D	3.	D	4.	E	5.	E
6.	C	7.	D	8.	E	9.	B	10.	C
11.	E	12.	C	13.	B	14.	B	15.	C
16.	D	17.	B						

9. $\sum_{k=0}^{\infty}\left(\sin\frac{\pi}{6}\right)^k$

a. 1
b. 2
c. $\frac{1}{1-\frac{\sqrt{3}}{2}}$
d. $\frac{\frac{\sqrt{3}}{2}}{1-\frac{\sqrt{3}}{2}}$
e. Does not converge

10. For which pair of functions $f(x)$ and $g(x)$ below will the $\lim_{x\to\infty}\frac{f(x)}{g(x)}=0$?

	$f(x)$	$g(x)$
a.	e^x	x^2
b.	e^x	$\ln x$
c.	$\ln x$	e^x
d.	x	$\ln x$
e.	3^x	2^x

11. Which of the following improper integrals converges?

I. $\int_0^{\infty} e^{-x}dx$

II. $\int_0^1 \frac{1}{x^2}dx$

III. $\int_0^1 \frac{1}{\sqrt{x}}dx$

a. I only
b. III only
c. I and II
d. II and III
e. I and III

12. The rate of decay of a radioactive substance is proportional to the amount of substance present. Four years ago there were 12 grams of substance. Now there are 8 grams. How many grams will there be 8 years from now?

a. 0
b. 8/3
c. 32/9
d. 81/16
e. 16/3

13. $\lim_{x\to 0}\frac{\int_1^{1+x}\frac{\cos t}{t}dt}{x}=$

a. $-\cos 1$
b. $\cos 1$
c. $-\sin 1$
d. $\sin 1$
e. nonexistent

14. $\lim_{x\to 2}\frac{2^{x/2}-2}{2^x-4}=$

a. 0
b. 1/4
c. 1/2
d. ln2
e. nonexistent

15. If $\int x\sec^2 x dx = f(x)+\ln|\cos x|+C$, then $f(x)=$

a. $\tan x$
b. $\frac{1}{2}x^2$
c. $x\tan x$
d. $x^2\tan x$
e. $\tan^2 x$

16. Consider the differential equation $\frac{dy}{dx}=y-2x+3$, where $y=f(x)$ is the solution to the equation and $f(2)=5$. Using Euler's Method starting at $x_0=2$ with step size $\Delta x=0.5$, what is the approximation for $f(3)$?

a. 7
b. 8.5
c. 9
d. 9.5
e. 11

17. $\int 2^{3x}dx=$

a. $\frac{2^{3x}}{\ln 2}+C$
b. $\frac{2^{3x}}{3\ln 2}+C$
c. $\frac{2^{3x+1}}{3x+1}+C$
d. $\frac{2^{3x}}{3}+C$
e. $(\ln 2)2^{3x}+C$