1. Which of these is equal to $\int_1^{e^{\frac{1}{2}}} \frac{dt}{t}$?

a) $\cos\frac{\pi}{3}$ b) .5 c) $\sin\frac{\pi}{6}$ d) All of these answers e) NOTA

2. If $G(x)=\int_0^x g(t)dt$, then $\frac{1}{3}\int_3^6 g(t)dt$ represents what, given that G(x) is a continuous function?

a) The average rate of change of $G(x)$ on $(3,6)$. b) The average value of $G(x)$ on $(3,6)$.
c) One-third the area between $g(t)$ and the x-axis on $(3,6)$. d) All of these answers e) NOTA

3. If $\frac{dy}{dx}=3y$ and $y(1)=1$, then find $y(2)$.

a) e b) e^2 c) e^3 d) e^4 e) NOTA

4. Evaluate: $\int_0^1 \frac{8x+4}{1+x^2}dx$

a) 1 b) e c) $\pi+\ln 8$ d) $\ln(16e^{\pi})$ e) NOTA

5. What is the error found when the Trapezoidal Rule with $n=4$ is used to approximate $\int_1^5 3a^2 da$?

a) 2 b) 1 c) .5 d) 0 e) NOTA

For Questions 6 and 7, let $f(t)=2\int_0^t x(\cosh^2 x-\sinh^2 x)dx$, where $\cosh x=\frac{1}{2}(e^x+e^{-x})$,

and $\sinh x=\frac{1}{2}(e^x-e^{-x})$.

6. Find $f(.5)$.

a) 0 b) .25 c) .5 d) 1 e) NOTA

7. Find the area bounded by the curves $y=f(t)$ and $y=f'(t)$.

a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) 1 d) $\frac{4}{3}$ e) NOTA

8. A region D is closed and bounded by some curve C in the *x*-*y* plane. In order to form a container, Becca builds the solid by placing on C adjacent endpoints of squares with sides perpendicular to the *x*-axis. Skiya does the same thing, except she replaces the squares with equilateral triangles, and makes 2 identical containers instead. After completing their tasks, both Becca and Skiya claim that they can hold more volume in their own object(s). Who is right?

a) Becca b) Skiya c) Neither, the volumes are equal d) Need more information e) NOTA

9. Given that $\int_0^{\pi} \sin x\,dx = 2$, find $\int_0^{k\pi} |\sin x|\,dx$, where $k \in Integers$.

a) 0 b) 2 c) .5*k* d) -2*k* e) NOTA

10. If $a < 1$ and $b > 1$, for varying real numbers *a*,*b* and constant *c*, $\int_a^b |x-1|\,dx = c$ forms some curve T in the *a*-*b* plane. Find the length of T.

a) $\frac{\pi\sqrt{2c}}{2}$ b) $2\pi\sqrt{2c}$ c) $2\pi c$ d) $4\pi c$ e) NOTA

11. Which of these has an antiderivative of $\ln(\sin 2x+1)-\ln(\cos 2x)$ $\forall x \in \left(0, \frac{\pi}{4}\right)$?

a) $\sec 2x$ b) $\csc 2x$ c) $2\sec 2x$ d) $2\csc 2x$ e) NOTA

12. Consider the smaller of the two regions bounded by the curves $y = 2x^2, x = 1,$ and $y = 8$. When this region is rotated about the *x*-axis, Matt finds the volume of the solid formed to be $2\pi\int_1^2 (32-2x^4)dx$. In order to find the volume, Matt used the _____ method.

a) Disc b) Washer c) Shell d) Levine e) NOTA

13. What is the volume of the solid formed in Question 12?

a) $\frac{182}{5}\pi$ b) $\frac{188}{5}\pi$ c) $\frac{196}{5}\pi$ d) $\frac{212}{5}\pi$ e) NOTA

14. What type of relation is represented by the following statement? "The slope of a tangent line to the curve at any given point is directly proportional to abscissa of the point and inversely proportional to the ordinate."

a) Line b) Ellipse c) Hyperbola d) Need more information e) NOTA

15. If $\int f'(g(2x))dx = f(g(2x)) + C$ and $g(0) = 8$, find $g(4)$, given that $f'(y) \neq 0, \forall y$.

a) 6 b) 8 c) 10 d) 12 e) NOTA

16. Evaluate: $\int_1^2 x\sqrt{x-1}dx$

a) $\frac{11}{15}$ b) $\frac{13}{15}$ c) $\frac{16}{15}$ d) $\frac{17}{15}$ e) NOTA

17. For $y > 0$, the region bounded by the curves $y = 0, x = 0, x = \sqrt{2}$, and $y = \cos(\sin^{-1}(\cos(\sin^{-1}(\cos(...)))))$ has area A. What is A?

a) .5 b) 1 c) π d) 1.5π e) NOTA

18. The statement $\lim_{n\to\infty} f(n) = 0$ is a _____ condition for $\sum_{n=0}^{\infty} f(n)$ to converge.

a) necessary b) sufficient c) necessary and sufficient d) Lipshitz e) NOTA

19. Let $f(x) = \int_{\frac{-\pi}{4}}^{x} \frac{p(t)dt}{e^{t^2}\cos t}$, where p(*t*) is an odd polynomial function with real coefficients. Which must be true of a '*c*' guaranteed by the Mean Value Theorem for Derivatives for f(*x*) on $\left[\frac{-\pi}{4}, \frac{\pi}{4}\right]$?

a) $f(c) = 0$ b) $p(c) = 0$ c) $p'(c) = 0$ d) No such '*c*' exists e) NOTA

20. Evaluate: $\int_0^{.25\pi} \tan\theta\cos\theta d\theta$

a) 0 b) 1 c) $\frac{\sqrt{2}}{2}$ d) $1 - \frac{\sqrt{2}}{2}$ e) NOTA

21. Find: $\lim_{n\to\infty}\left(\ln\left(\sqrt{2}\cdot\sqrt[3]{3}\cdot\sqrt[4]{4}\cdot...\sqrt[n]{n}\right)\right)$

a) 1 b) ln 2 c) e d) Does not exist e) NOTA

For Questions 22-23, let $f(n) = \int_0^2 \prod_{k=1}^{n} x^k dx$ and $g(n) = \int_0^2 \prod_{k=0}^{n} y^k dy$. (Note: Both questions have the same answer choices, and the symbols used in the question are for the integral and the product.)

22. Find $\frac{f(100)}{f(99)}$.

23. Find $\frac{f(100)}{g(99)}$.

a) $\frac{5049}{2525}$ b) $\frac{5050}{5051}$ c) $\frac{10100}{5051}$ d) $\frac{5049}{5050}$ e) NOTA

24. Ada's function, A(t), is defined to be the distance that a runner (initially at rest) with velocity v(x) (v nonnegative) travels on an interval $[0,2t]$ divided by the square of *t*. Find $\lim_{t\to 0^+} A(t)$

a) v(0) b) 2v(0) c) a(0), (where a(*t*) is the acceleration function of the runner)
d) 2a(0) e) NOTA

25. Evaluate: $\int_1^e e^x(\ln x)(x+1)dx$. Hint: First evaluate $\int e^t \ln t dt$.

a) $e^e(e-1)+e$ b) $e^e(e+1)+1$ c) e^e+1 d) $e^2\ln 2-1+e$ e) NOTA

26. For positive integer b, evaluate: $\lim_{n\to\infty}\sum_{k=0}^{3n}\frac{b^{\frac{k}{n}}}{n}$

a) $\frac{b^3-1}{3\ln b}$ b) $\frac{b-1}{\ln b}$ c) $\frac{b^3-1}{\ln b}$ d) $\frac{b-1}{b}$ e) NOTA

27. Find the area of the larger region bounded by $x=|2|, y=|2|$, and $y=2-x$.

a) 2 b) 12 c) 13 d) 16 e) NOTA

28. Rotating a rectangle about a line will _____ form a cylinder.

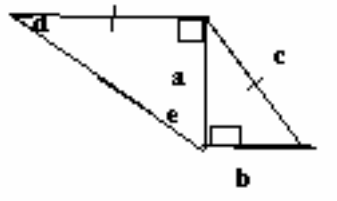
a) always b) sometimes c) never (it forms a pyramid)
d) never (it forms a torus) e) NOTA

29. Using the definitions given for problems 6 and 7, let $f(x)=\sinh x$ and let $g(x)=\cosh x$. What type of curve is $y=(f'(x))^2-(g'(x))^2$?

a) line b) parabola c) hyperbola d) trigonometric curve e) NOTA

30. Let $f(x)=\int_0^x \frac{\cos z}{1+\sin^2 z}dz$ Given the diagram below, find f(T), where angle T is formed by sides *b* and *c*.

*Note: *a, b,* and *c* refer to side lengths and *d* and *e* refer to angles in radians, with figure not to scale.



a) a b) b c) c d) d e) e