If no answer is correct choose NOTA.

1. Find the length of the curve $y = \int_1^x \sqrt{t^3 - 1}\, dt, 1 \le x \le 2$.

a. $\int_1^2 \sqrt{x^3 - 1}\, dx$
b. $\frac{4\sqrt{2}}{5}$
c. $2\sqrt{2} - 1$
d. $\frac{2}{5}\left(4\sqrt{2} - 1\right)$
e. NOTA

2. Evaluate $\int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}} dx$

a. $\frac{2}{e}$
b. 1
c. $\frac{2}{\sqrt{e}}$
d. $2e$
e. NOTA

3. Evaluate $\int_1^2 \sin(\ln(x))dx$

a. $\frac{\tan(\ln 2)}{2}$
b. $\sin(\ln 2) - \cos(\ln 2) + \frac{1}{2}$
c. $\cos(\ln 2) - \sin(\ln 2) + 1$
d. $\tan(\ln 2) + \frac{1}{2}$
e. NOTA

4. $\int_1^2 \frac{5x + 3}{x^3 - 2x^2 - 3x} dx =$

a. $\ln\left(4\sqrt{3}\right)$
b. $-\frac{1}{2}\ln 48$
c. $\ln\frac{\sqrt{3}}{3}$
d. $-\ln 3$
e. NOTA

5. $\lim_{x \to 0} \frac{x}{3\sin(x)\cos(x)} =$

a. $\frac{1}{2}$
b. $\frac{1}{6}$
c. $\frac{1}{3}$
d. $\frac{1}{4}$
e. NOTA

6. Find the area of the region between the curves $y = \frac{1}{x}$ and $y = \frac{1}{x^3 + x}$ on $(0,1]$.

a. ∞
b. $\frac{\ln 2}{4}$
c. $\frac{\ln 2}{2}$
d. $\ln 2$
e. NOTA

7. Let $f(t)=\frac{2}{1-t^2}$ and $G(x)=\int_0^x f(t)dt$.
Find the MacLaurin Series for function G.

a. $\sum_{n=0}^{\infty}\frac{2x^{2n+1}}{2n+1}$
b. $\sum_{n=0}^{\infty}\frac{x^{2n+1}}{2n+1}$
c. $\sum_{n=0}^{\infty}2x^{n}$
d. $\sum_{n=0}^{\infty}\frac{2x^{2n}}{2n+1}$
e. NOTA

8. Consider the power series $\sum_{n=0}^{\infty}a_n x^n$, where $a_0=1$ and $a_n=\frac{2}{n}a_{n-1}$ for $n\geq 1$. If f is the function represented by this power series, what is $f'(1)$?

a. e
b. $2e^2$
c. $\frac{e^2}{2}$
d. $2e$
e. NOTA

9. Use a Taylor polynomial centered at 0 to obtain a quadratic approximation of $y=e^{\sin x}$ near $x=0$ and use it to approximate $e^{\sin(0.5)}$.

a. 1.625
b. 1.65
c. 1.675
d. 1.688
e. NOTA

10. Find the function represented by $\sum_{n=0}^{\infty}\left(\frac{\sqrt{x}}{2}-1\right)^n$.

a. $\frac{2}{4-\sqrt{x}}$ on $(0,16)$
b. $\frac{2}{\sqrt{x}-2}$ on $(0,4)$
c. $\frac{1}{2-\sqrt{x}}$ on $(0,4)$
d. $\frac{1}{4-\sqrt{x}}$ on $[0,16)$
e. NOTA

11. Which of the following series converge?

I. $\sum_{n=1}^{\infty}(-1)^n\frac{1}{2n+1}$ II. $\sum_{n=1}^{\infty}\frac{2^n}{3^n+1}$ III. $\sum_{n=1}^{\infty}\left(1+\frac{1}{n}\right)^n$

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

12. If $x(t)=1-t^3$ and $y(t)=t-t^2$, express $\frac{d^2y}{dx^2}$ as a function of t.

a. $\frac{2t-3}{3t^2}$
b. $\frac{2t-2}{9t^5}$
c. $\frac{-2t+2}{3t^3}$
d. $\frac{2t+2}{3t^3}$
e. NOTA

13. A particle moves from $t = 0$ to $t = 4$ along the curve defined by $x(t) = \frac{t^2}{2}$ and $y(t) = \frac{1}{3}(2t+1)^{3/2}$ on [0,4]. At what value of t has the particle covered half the length of the curve?

a. $-2+\sqrt{15}$
b. $-1+\sqrt{10}$
c. $-1+\sqrt{15}$
d. $-1+\sqrt{13}$
e. NOTA

14. $\vec{r}(t) = (2\cos t)\vec{i} + (4\sin t)\vec{j}$ describes the position vector of a particle in the plane. Find its speed at $t = \frac{\pi}{4}$.

a. $\sqrt{10}$
b. $2\sqrt{2}$
c. $\frac{\sqrt{10}}{2}$
d. $\sqrt{2}$
e. NOTA

15. $r = 2\sin(3\theta)$ for $0 \le \theta \le \pi$ defines a rose curve with 3 petals. As θ increases the curve begins at the pole and the first of the 3 petals is created. What is the slope of the tangent line to the petal at the point where the curve first returns to the pole?

a. 0
b. $\frac{1}{2}$
c. $\frac{\sqrt{3}}{2}$
d. $\sqrt{3}$
e. NOTA

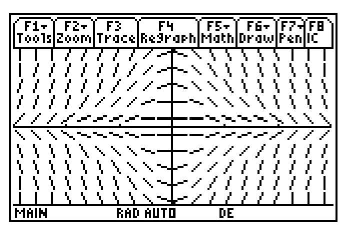
16. Find the area enclosed by one loop of $r^2 = 9\cos(2\theta)$.

a. $\frac{11}{2}$
b. $\frac{9}{2}$
c. $\frac{7}{2}$
d. $\frac{5}{2}$
e. NOTA

17. Evaluate $\int_0^2\int_0^1 (4 - x - y)\,dy\,dx$

a. 5
b. 4.5
c. 4
d. 3
e. NOTA

18. The given slopefield could be used for which differential equation?



a. $\frac{dy}{dx} = 2x^2y$
b. $\frac{dy}{dx} = -2xy$
c. $\frac{dy}{dx} = x + y$
d. $\frac{dy}{dx} = xy$
e. NOTA

19. If $\frac{dy}{dx} = 20y(y-1)$, find y in terms of x if $y(0) = \frac{1}{2}$.

a. $\frac{1}{2e^{20x}}$
b. $1 - \frac{1}{2e^{20x}}$
c. $-1 + \frac{3}{2e^{20x}}$
d. $\frac{1}{1+e^{20x}}$
e. NOTA

20. If $f'(x) = x + f(x)$ for all real numbers x and $f(1) = 2$, use Euler's method starting at x = 1 with a step size of 0.5 to approximate $f(2)$.

a. 5.9
b. 6
c. 6.5
d. 7
e. NOTA

21. Evaluate $\int_0^1 \arctan(x)\,dx$

a. $\frac{\pi}{4} - \frac{\ln 2}{2}$
b. $\frac{\pi}{4} - \ln 2$
c. $\frac{\pi}{2} - \frac{\ln 2}{2}$
d. $\frac{\pi}{2} - \ln 2$
e. NOTA

22. Calculate the curvature of the graph of $y = x^3 - 2x$ at $(1, -1)$.

a. 3
b. $\frac{2\sqrt{3}}{3}$
c. $\frac{3\sqrt{2}}{2}$
d. 1.5
e. NOTA

23. Evaluate $\sum_{n=1}^{100} \frac{1}{n^2+n}$

a. $\frac{102}{101}$
b. $\frac{101}{100}$
c. $\frac{100}{101}$
d. $\frac{99}{100}$
e. NOTA

24. A tank with a rectangular base of 2 feet by 4 feet has a vertical height of 3 feet. If the tank is filled with water (which weighs 62.5 pounds per cubic foot), find the work in ft-pounds required to pump the water to a point 2 feet above the top of the tank.

a. 5250
b. 9750
c. 10450
d. 11250
e. NOTA

25. Evaluate $\lim_{x \to 0^+} (1+3x)^{\frac{1}{2x}}$

a. 0.5
b. $\sqrt{e}$
c. $\sqrt[3]{e^2}$
d. 1.5
e. NOTA

26. Given that $\cosh(x) = \dfrac{e^x + e^{-x}}{2}$, find a Taylor Series centered at $x = 0$ for $\cosh(x)$.

a. $\sum_{n=0}^{\infty} \dfrac{x^n}{n!}$
b. $\sum_{n=0}^{\infty} \dfrac{2x^n}{(2n)!}$
c. $\sum_{n=0}^{\infty} \dfrac{x^n}{(2n)!}$
d. $\sum_{n=0}^{\infty} \dfrac{x^{2n}}{(2n)!}$
e. NOTA

27. Suppose that a population grows according to the logistic equation $\dfrac{dP}{dt} = 0.05P - 0.0005P^2$ where t is in weeks. What is the carrying capacity (the maximum population that can be sustained)?

a. 5
b. 50
c. 100
d. 500
e. NOTA

28. What is the least number of terms of the given series that we need to add in order for the error to be less than 0.01 when approximating S? $S = \sum_{n=1}^{\infty} \dfrac{(-2)^n}{n!}$

a. 6
b. 7
c. 8
d. 9
e. NOTA

29. $\int_0^2 \dfrac{x^2+12}{x^2+4}\,dx =$

a. 2π
b. π
c. $2+\sqrt{2}$
d. $\pi + \ln 2$
e. NOTA

30. Evaluate $\int_0^{\frac{\pi}{4}} \cos^2 x \, dx$

a. $\dfrac{1}{2}$
b. $\dfrac{\sqrt{2}}{12}$
c. $\dfrac{\pi}{4} + \dfrac{1}{2}$
d. $\dfrac{\pi}{8} + \dfrac{1}{4}$
e. NOTA