

1. Find the area of the region bounded by the graphs  $y = xe^x$ ,  $x = 0$  and  $x = \ln 2$ .

2. If  $F(x) = \int_0^{x^2} \sqrt{t+3} dt$  what is  $F'(x)$ ?

3. If  $e^y \frac{dy}{dx} = 2x$  and  $y(1) = 2$ , then the particular solution  $y(x)$  is

4. A particle moves in the  $xy$  plane such that its position for time  $t \geq 0$  is given by  $x(t) = 3t^2 - 19t$  and  $y(t) = e^{2t-7}$ . What is the slope of the tangent to the path of the particle when  $t = 4$ ?

5. If  $f(x) = \sin(x^2)$ , the first 3 terms of the Taylor series expansion about  $x = 0$  for  $f'(x)$  are

6. If  $\ln y = (\ln x)^2 + 2$  find  $\frac{dy}{dx}$  in terms of  $y$

7. For time  $0 \leq t \leq 10$ , a particle moves along the  $x$ -axis with position given by  $x(t) = t^3 - 7t^2 + 8t + 5$ . During what time intervals is the speed of the particle increasing?

8.

X	-4	-3	-2	-1	0	1	2	3	4
F(x)	.48	1.25	1.07	.53	.27	1.04	3.56	2.18	2

Selected values for the continuous function  $f(x)$  are given in the table above. Using 3 left-hand rectangles of equal width, find the approximation for

$$\int_{-3}^3 f(x) dx$$

$$9. \int_3^{12} (x-3)^{-\frac{1}{2}}$$

10. Let  $f(x) = x^2 e^x$  on the interval  $-10 \leq x \leq 0$ . Find the absolute maximum of  $f(x)$ .

$$11. \lim_{h \rightarrow 0} \frac{\sin\left(\frac{\pi}{6} + h\right) - \frac{1}{2}}{h}$$

12. Consider the curve defined by the parametric equations  $x(t) = 3 + \sin t$  and  $y(t) = 2t^2 + 5t + 1$ . For time  $t$  find  $\frac{d^2 y}{dx^2}$ .

13. Find the area enclosed by the polar curve  $r \cos \frac{1}{2} \theta = 1$  in the interval

$$0 \leq \theta \leq \frac{\pi}{2}.$$

14.  $\lim_{x \rightarrow 0} \frac{\cos x - e^x}{\ln(1+x)}$

15.  $\int_0^1 \frac{3}{x} dx$

16. Give the integral that expresses the volume of the solid generated by revolving the region enclosed between the graph of  $y = 1 + x^2$  and the lines  $y = 1$  and  $x = 2$  about the x-axis.

17. A particle moves in the xy plane with position vector  $\langle x(t), y(t) \rangle$  such that  $x(t) = t^3 - 6t^2 + 9t + 1$  and  $y(t) = -t^2 + 6t + 2$  in the time interval  $0 \leq t \leq 5$ . What is the average speed of the particle for the time interval?

18.  $\int \frac{1}{16 + x^2}$

19. What is the slope of the curve  $2xy^2 = 3x^2 - y^3$  at  $(1,1)$

20. What are all the values of  $a$  for which the series  $\sum_{k=1}^{\infty} \frac{k^2}{k^{2a-3} + 4}$  converges?