1. $\lim\limits_{n\to\infty}\left[\dfrac{10}{n}\sum\limits_{i=1}^{n}\sqrt{\dfrac{10\,n+4i}{2n}}\right] =$

(a) $\dfrac{10}{3}(7\sqrt{7}-5\sqrt{5})$

(b) $\dfrac{10}{3}(\sqrt{7}-\sqrt{5})$

(c) $\dfrac{5}{3}(7\sqrt{7}-5\sqrt{5})$

(d) $\dfrac{5}{3}(\sqrt{7}-\sqrt{5})$

(e) $\dfrac{2}{3}(\sqrt{7}-\sqrt{5})$

2. Using 3 approximating rectangles and midpoints, the approximation of the area under $f(x) = \dfrac{x+1}{x}$, $1 \le x \le 7$, is

3. $$\int_{\pi}^{3\pi/2} \sqrt{1-\cos^2 t}\, dt =$$

4. $$\int_{4}^{10} \frac{t}{t^2-4}\, dt =$$

5. The value of the definite integral $\int_0^{3/2} \sqrt{9-4x^2}\,dx$ is
(Hint: You may use areas)

6. $\lim_{n\to\infty} \sum_{k=1}^{n} \frac{n}{3n^2+k^2} =$

(a) $\frac{\pi}{6\sqrt{3}}$

(b) $\frac{\pi}{3\sqrt{3}}$

(c) $\frac{\pi}{4\sqrt{3}}$

(d) $\frac{1}{3\sqrt{3}}$

(e) $\frac{1}{6\sqrt{3}}$

7. Let f be a continuous function on $[-1, 4]$ such that:

$$\int_{-1}^{2} f(t)\,dt = 5 \text{ and } \int_{1}^{2} f(2t)\,dt = 2,$$

then $\int_{-1/3}^{4/3} f(3t)\,dt =$

8. The volume of the solid generated by revolving the region bounded by the curves $y = \cos x$ and $y = 0$, for $0 \leq x \leq \frac{\pi}{2}$, about the line $y = -1$ is given by

Set up

9. Let f be the function defined on R by

$$f(x) = \int_0^x (4 - t^2)\, e^{t^3}\, dt.$$

Which of the following statement is **FALSE**?

(a) f is decreasing on $[-2, 2]$

(b) $f(2) > 0$

(c) $f(-2) < 0$

(d) $f(0) = 0$

(e) $f(1) > 0$

10. The area of the region bounded by the curves $y^2 = 2x + 1$ and $x + y = 1$ is equal to

11. If $y = \int_{\cos x}^{\sin(3x)} \sqrt{t^2+3}\, dt$ then $\dfrac{dy}{dx}$ at $x = 0$ is equal to:

12. A particle moves along a line so that its velocity at time t is $v(t) = t^3 - 4t$ m/s. Then the distance traveled during the time period $0 \le t \le 4$ is

13. $\displaystyle\int_0^1 \frac{1}{(2-\sqrt{x})^2}\,dx =$

14. $\displaystyle\int \frac{\sec^2\left(\frac{\pi}{x}\right)}{x^2}\,dx =$

15. $\displaystyle\int \frac{(1+\sqrt{t})^{2/3}}{\sqrt{t}}\,dt =$

16. Let g be a differentiable function and let

$$f(x) = \int_0^{g(x)} \frac{t}{\sqrt{4+5t^2}}\,dt.$$

If $f'(1) = 1$, and $g'(1) = 3$, then $f(1) =$

17. The base of a solid is a semi-circle of radius 1. Parallel cross-sections perpendicular to the base are squares with two of their vertices on the semi-circle. The volume of the solid is:

18. The volume of the solid obtained by rotating the region enclosed by the curves $y = x^2$ and $y = \sin\left(\frac{\pi x}{2}\right)$ around the x-axis is

(Hint: Use the identity $\sin^2\theta = (1 - \cos 2\theta)/2$).

(e) $\frac{\quad}{10} - \frac{\quad}{2}$

19. Let m be an integer ≥ 2 and f be the function defined on $[2, \infty)$ by $f(x) = \int_2^x \frac{1}{t\,(\ln\,t)^m}\,dt$.
Which of the following statements is **FALSE**:

(a) $f(x) = \dfrac{2}{1-m}\left[\dfrac{1}{(\ln\,(x))^{m-1}} - \dfrac{1}{(\ln\,2)^{m-1}}\right]$

(b) $f'(x) = \dfrac{1}{x(\ln\,x))^m}$

(c) $f(2) = 0$

(d) $f(3) > f\left(\dfrac{5}{2}\right)$

(e) f is continuous on $[2, \infty)$

20. Let f be a continuous increasing function defined on the interval $[a, b]$ such that $f(x) \geq 0$, $\forall x \in [a, b]$. Let R_n be the Riemann sum of f corresponding to a subdivision of $[a, b]$ into n subintervals using right end points, L_n is the corresponding sum using left end points. Let A be the area of the region under the graph $y = f(x)$. Which of the following statements is **FALSE**?