33. If $y = x^2 e^x$, then $\frac{dy}{dx} =$

(A) $2xe^x$ (B) $x\left(x+2e^x\right)$ (C) $xe^x(x+2)$ (D) $2x+e^x$ (E) $2x+e$

35. If $y = \frac{\ln x}{x}$, then $\frac{dy}{dx} =$

(A) $\frac{1}{x}$ (B) $\frac{1}{x^2}$ (C) $\frac{\ln x - 1}{x^2}$ (D) $\frac{1-\ln x}{x^2}$ (E) $\frac{1+\ln x}{x^2}$

36. $\int \frac{x}{\sqrt{3x^2+5}}\,dx =$

(A) $\frac{1}{9}\left(3x^2+5\right)^{3/2}+C$ (B) $\frac{1}{4}\left(3x^2+5\right)^{3/2}+C$ (C) $\frac{1}{12}\left(3x^2+5\right)^{1/2}+C$

(D) $\frac{1}{3}\left(3x^2+5\right)^{1/2}+C$ (E) $\frac{3}{2}\left(3x^2+5\right)^{1/2}+C$

37. $\lim_{h\to 0} \frac{\tan 3(x+h) - \tan(3x)}{h} =$

(A) 0 (B) $3\sec^2(3x)$ (C) $\sec^2(3x)$ (D) $3\cot(3x)$ (E) nonexistent

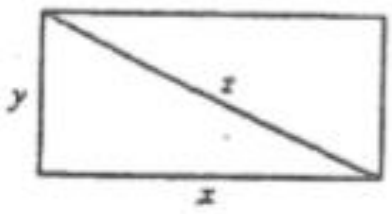
38. What is the average value of $y$ for the part of the curve $y = 3x - x^2$ which is in the first quadrant?

(A) $-6$ (B) $-2$ (C) $\frac{3}{2}$ (D) $\frac{9}{4}$ (E) $\frac{9}{2}$

39. If $\int_1^{10} f(x)\,dx = 4$ and $\int_{10}^{3} f(x)\,dx = 7$, then $\int_1^3 f(x)\,dx =$

(A) $-3$ (B) 0 (C) 3 (D) 10 (E) 11

40.

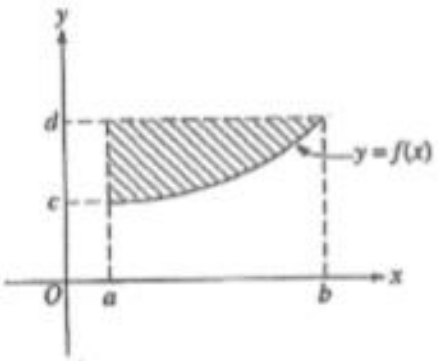



The sides of the rectangle above increase in such a way that $\frac{dz}{dt} = 1$ and $\frac{dx}{dt} = 3\frac{dy}{dt}$.

At the instant when $x = 4$ and $y = 3$, what is the value of $\frac{dx}{dt}$?

(A) $\frac{1}{3}$ (B) 1 (C) 2 (D) $\sqrt{5}$ (E) 5

42.




Which of the following represents the area of the shaded region in the figure above?

(A) $\int_c^d f(y)\,dy$ (B) $\int_a^b (d-f(x))\,dx$ (C) $f'(b)-f'(a)$

(D) $(b-a)[f(b)-f(a)]$ (E) $(d-c)[f(b)-f(a)]$

---

43. If $x^3+3xy+2y^3=17$, then in terms of $x$ and $y$, $\frac{dy}{dx}=$

(A) $-\frac{x^2+y}{x+2y^2}$ (B) $-\frac{x^2+y}{x+y^2}$ (C) $-\frac{x^2+y}{x+2y}$ (D) $-\frac{x^2+y}{2y^2}$ (E) $\frac{-x^2}{1+2y^2}$

---

44. $\int \frac{3x^2}{\sqrt{x^3+1}}\,dx=$

(A) $2\sqrt{x^3+1}+C$ (B) $\frac{3}{2}\sqrt{x^3+1}+C$ (C) $\sqrt{x^3+1}+C$ (D) $\ln\sqrt{x^3+1}+C$ (E) $\ln(x^3+1)+C$

---

45. For what value of $x$ does the function $f(x)=(x-2)(x-3)^2$ have a relative maximum?

(A) $-3$ (B) $-\frac{7}{3}$ (C) $-\frac{5}{2}$ (D) $\frac{7}{3}$ (E) $\frac{5}{2}$

---

47. If $f(x)=\sin\left(\frac{x}{2}\right)$, then there exists a number $c$ in the interval $\frac{\pi}{2}<x<\frac{3\pi}{2}$ that satisfies the conclusion of the Mean Value Theorem. Which of the following could be $c$?

(A) $\frac{2\pi}{3}$ (B) $\frac{3\pi}{4}$ (C) $\frac{5\pi}{6}$ (D) $\pi$ (E) $\frac{3\pi}{2}$

---

48. If $f(x)=(x-1)^3\sin x$, then $f'(0)=$

(A) $-2$ (B) $-1$ (C) 0 (D) 1 (E) 2

---

49. The acceleration of a particle moving along the $x$-axis at time $t$ is given by $a(t)=6t-2$. If the velocity is 25 when $t=3$ and the position is 10 when $t=1$, then the position $x(t)=$

(A) $9t^2+1$ (B) $3t^2-2t+4$ (C) $t^3-t^2+4t+6$

(D) $t^3-t^2+9t-20$ (E) $36t^3-4t^2-77t+55$