19. What are all values of x for which $\int_x^2 t^3\,dt$ is equal to 0 ?

(A) -2 only (B) 0 only (C) 2 only (D) -2 and 2 only (E) -2, 0, and 2

20. Let h be the function defined by $h(x) = \int_{\pi/4}^{x} \sin^2 t\,dt$. Which of the following is an equation for the line tangent to the graph of h at the point where $x = \frac{\pi}{4}$?

(A) $y = \frac{1}{2}$

(B) $y = \sqrt{2}x$

(C) $y = x - \frac{\pi}{4}$

(D) $y = \frac{1}{2}\left(x - \frac{\pi}{4}\right)$

(E) $y = \frac{\sqrt{2}}{2}\left(x - \frac{\pi}{4}\right)$

22. A particle moves along the x-axis so that at time $t \geq 0$, the acceleration of the particle is $a(t) = 15\sqrt{t}$. The position of the particle is 10 when $t = 0$, and the position of the particle is 20 when $t = 1$. What is the velocity of the particle at time $t = 0$?

(A) -14 (B) 0 (C) 5 (D) 6 (E) 10

24. Sand is deposited into a pile with a circular base. The volume V of the pile is given by $V = \frac{r^3}{3}$, where r is the radius of the base, in feet. The circumference of the base is increasing at a constant rate of 5π feet per hour. When the circumference of the base is 8π feet, what is the rate of change of the volume of the pile, in cubic feet per hour?

(A) $\frac{8}{\pi}$ (B) 16 (C) 40 (D) 40π (E) 80π

25. $\lim_{h \to 0} \frac{e^{-1-h} - e^{-1}}{h}$ is

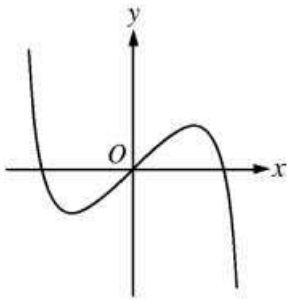
(A) -1 (B) $\frac{-1}{e}$ (C) 0 (D) $\frac{1}{e}$ (E) nonexistent

26. Let f be the function given by $f(x) = x^3 + 5x$. For what value of x in the closed interval $[1,3]$ does the instantaneous rate of change of f equal the average rate of change of f on that interval?

(A) $\sqrt{\frac{7}{3}}$ (B) $\sqrt{\frac{13}{3}}$ (C) $\sqrt{5}$ (D) $\sqrt{6}$ (E) $\sqrt{\frac{19}{3}}$

27. If $e^{xy} - y^2 = e - 4$, then at $x = \frac{1}{2}$ and $y = 2$, $\frac{dy}{dx} =$

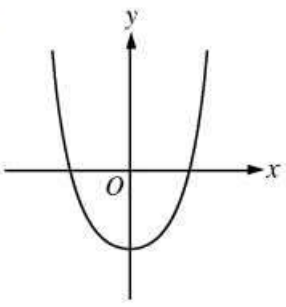
(A) $\frac{e}{4}$ (B) $\frac{e}{2}$ (C) $\frac{4e}{8-e}$ (D) $\frac{4e}{4-e}$ (E) $\frac{8-4e}{e}$



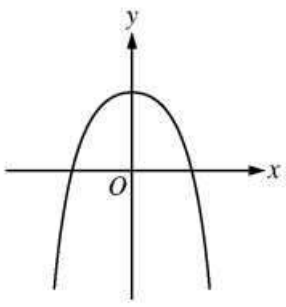
Graph of f

11. The graph of the function f is shown in the figure above. Which of the following could be the graph of f', the derivative of f?

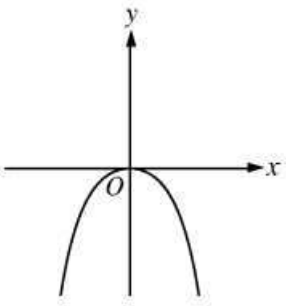
(A)



(B)



(C)



(D)