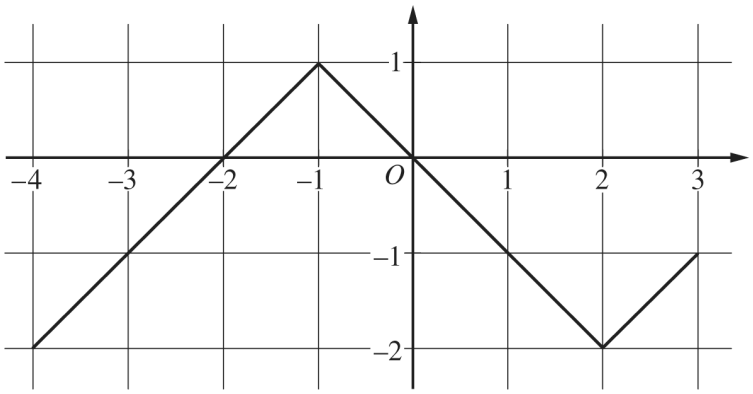
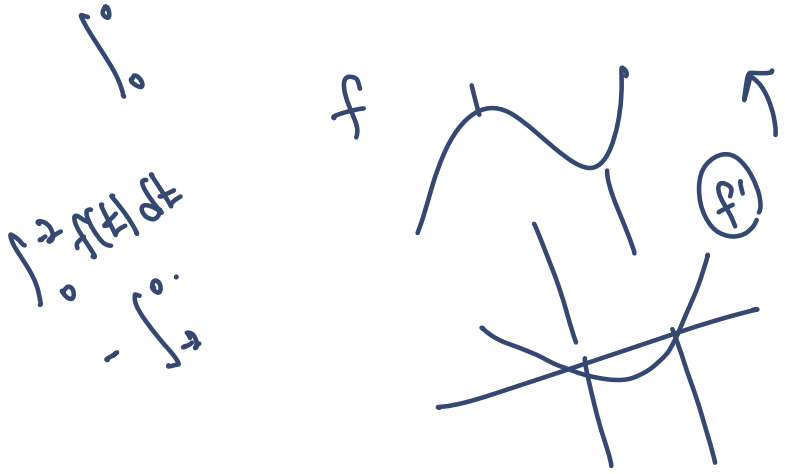


Graph of f

86. The graph of the function f shown above consists of three line segments. Let h be the function defined by $h(x) = \int_0^x f(t)\,dt$. At what value of x does h attain its absolute maximum on the interval $[-4, 3]$?

(A) -4 (B) -2 (C) 0 (D) 3

$h'(x) = f(x)$.



87. The position of a particle moving in the xy-plane is given by the parametric equations $x(t) = e^{-t}$ and $y(t) = \sin(4t)$ for time $t \geq 0$. What is the speed of the particle at time $t = 1.2$?

(A) 1.162 (B) 1.041 (C) 0.462 (D) 0.221

$x'(t) = -e^{-t}$

$y' = \cos(4t) \cdot 4$

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88. Let f be the function defined by $f(x) = \frac{1}{4}x^4 - \frac{2}{3}x^3 + \frac{1}{2}x^2 - \frac{1}{2}x$. For how many values of x in the open interval $(0, 1.565)$ is the instantaneous rate of change of f equal to the average rate of change of f on the closed interval $[0, 1.565]$?

(A) Zero (B) One (C) Three (D) Four

$x^3 - 2x^2 + x - \frac{1}{2} = \frac{f(1.565)}{1.565}$

GO ON TO THE NEXT PAGE.

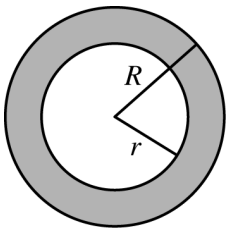
89. The population P of rabbits on a small island grows at a rate that is jointly proportional to the size of the rabbit population and the difference between the rabbit population and the carrying capacity of the population. If the carrying capacity of the population is 2400 rabbits, which of the following differential equations best models the growth rate of the rabbit population with respect to time t, where k is a constant?

(A) $\frac{dP}{dt} = 2400 - kP$

(B) $\frac{dP}{dt} = k(2400 - P)$

(C) $\frac{dP}{dt} = k\frac{1}{P}(2400 - P)$

(D) $\frac{dP}{dt} = kP(2400 - P)$



90. A region is bounded by two concentric circles, as shown by the shaded region in the figure above. The radius of the outer circle, R, is increasing at a constant rate of 2 inches per second. The radius of the inner circle, r, is decreasing at a constant rate of 1 inch per second. What is the rate of change, in square inches per second, of the area of the region at the instant when R is 4 inches and r is 3 inches?

(A) 3π (B) 6π (C) 10π (D) 22π

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