4. Snow is falling at a rate of $r(t) = 2e^{-0.1t}$ inches per hour, where t is the time in hours since the beginning of the snowfall. Which of the following expressions gives the amount of snow, in inches, that falls from time $t = 0$ to time $t = 5$ hours?

(A) $2e^{-0.5} - 2$

(B) $0.2 - 0.2e^{-0.5}$

(C) $4 - 4e^{-0.5}$

(D) $20 - 20e^{-0.5}$

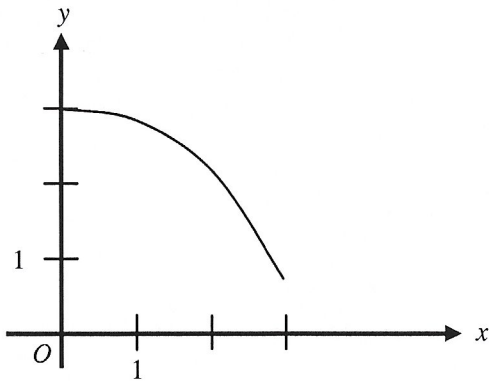
7. Let $y = f(x)$ be the solution to the differential equation $\frac{dy}{dx} = x - y - 1$ with the initial condition $f(1) = -2$. What is the approximation for $f(1.4)$ if Euler's method is used, starting at $x = 1$ with two steps of equal size?

(A) -2 (B) -1.24 (C) -1.2 (D) -0.64 (E) 0.2

t (hours)	4	7	12	15
$R(t)$ (liters/hour)	6.5	6.2	5.9	5.6

8. A tank contains 50 liters of oil at time $t = 4$ hours. Oil is being pumped into the tank at a rate $R(t)$, where $R(t)$ is measured in liters per hour, and t is measured in hours. Selected values of $R(t)$ are given in the table above. Using a right Riemann sum with three subintervals and data from the table, what is the approximation of the number of liters of oil that are in the tank at time $t = 15$ hours?

(A) 64.9 (B) 68.2 (C) 114.9 (D) 116.6 (E) 118.2



Graph of f

10. The graph of function f is shown above for $0 \le x \le 3$. Of the following, which has the least value?

(A) $\int_1^3 f(x)dx$

(B) Left Riemann sum approximation of $\int_1^3 f(x)dx$ with 4 subintervals of equal length

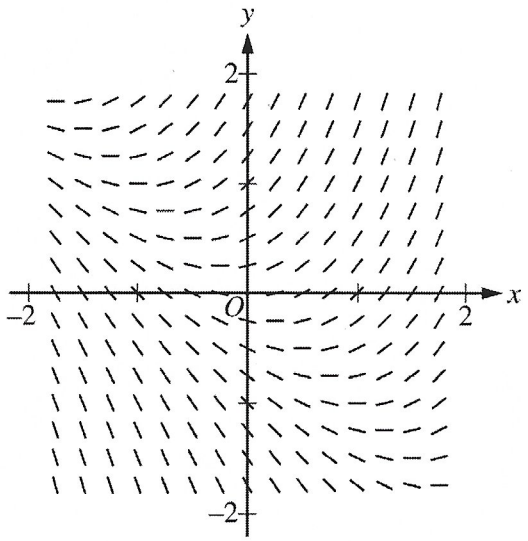
(C) Right Riemann sum approximation of $\int_1^3 f(x)dx$ with 4 subintervals of equal length

(D) Midpoint Riemann sum approximation of $\int_1^3 f(x)dx$ with 4 subintervals of equal length

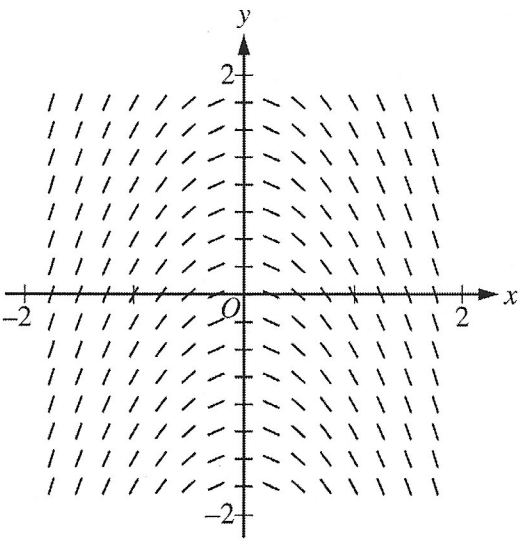
(E) Trapezoidal sum approximation of $\int_1^3 f(x)dx$ with 4 subintervals of equal length

16. Which of the following could be a slope field for the differential equation $\frac{dy}{dx} = x^2 + y$?

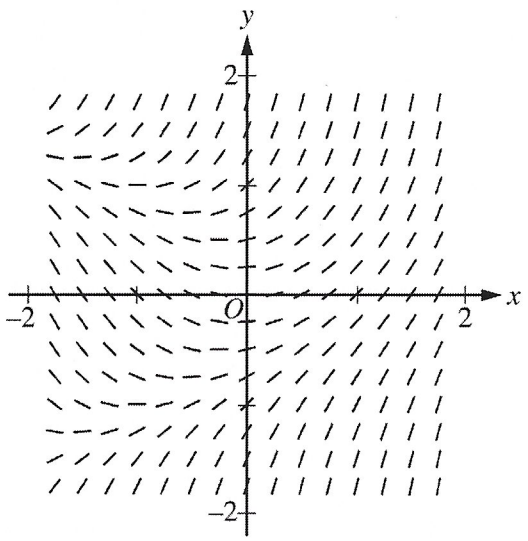
(A)



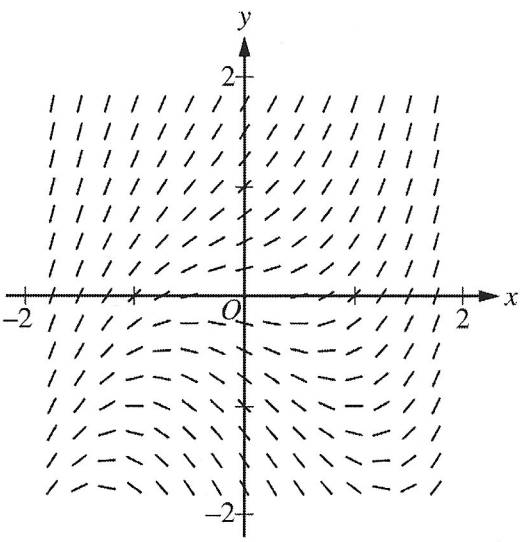
(B)



(C)

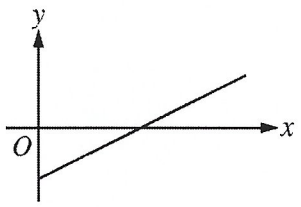


(D)



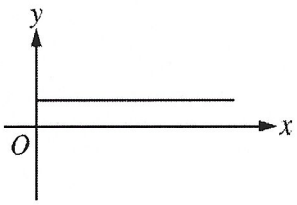
17. Let f be the function defined by $f(x) = \frac{1}{x}$. What is the average value of f on the interval $[4, 6]$?

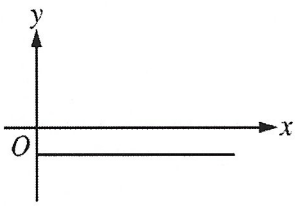
(A) $-\frac{1}{24}$ (B) $\frac{5}{24}$ (C) $\frac{1}{2}\ln\frac{3}{2}$ (D) $\ln\frac{3}{2}$ (E) $\frac{1}{2}\ln 2$

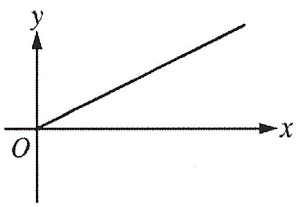


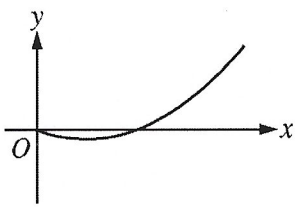
Graph of f

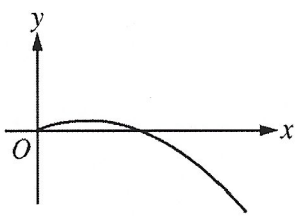
17. The figure above shows the graph of f. If $f(x) = \int_2^x g(t)\,dt$, which of the following could be the graph of $y = g(x)$?

(A)


(B)


(C)


(D)


(E)


Time (weeks)	0	2	6	10
Level	210	200	190	180

21. The table above gives the level of a person's cholesterol at different times during a 10-week treatment period. What is the average level over this 10-week period obtained by using a trapezoidal approximation with the subintervals [0, 2], [2, 6], and [6, 10] ?

(A) 188 (B) 193 (C) 195 (D) 198

25. Which of the following is the solution to the differential equation $\frac{dy}{dx} = e^{y+x}$ with the initial condition $y(0) = -\ln 4$?

(A) $y = -x - \ln 4$

(B) $y = x - \ln 4$

(C) $y = -\ln\left(-e^x + 5\right)$

(D) $y = -\ln\left(e^x + 3\right)$

(E) $y = \ln\left(e^x + 3\right)$

26. Let g be a function with first derivative given by $g'(x) = \int_0^x e^{-t^2}\, dt$. Which of the following must be true on the interval $0 < x < 2$?

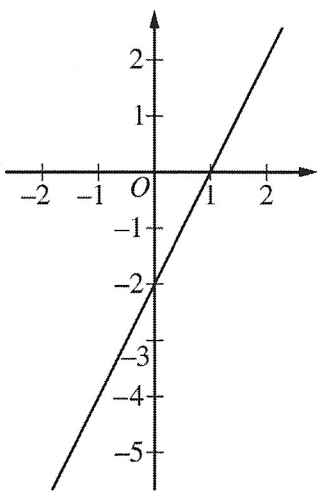
(A) g is increasing, and the graph of g is concave up.

(B) g is increasing, and the graph of g is concave down.

(C) g is decreasing, and the graph of g is concave up.

(D) g is decreasing, and the graph of g is concave down.

(E) g is decreasing, and the graph of g has a point of inflection on $0 < x < 2$.



Graph of f

27. The graph of the function f is shown above for $-2 < x < 2$. Let g be the function defined by $g(x) = \int_0^x f(t)\, dt$. On what open interval is g negative and decreasing?

(A) $-2 < x < 0$ only

(B) $-2 < x < 1$

(C) $0 < x < 1$ only

(D) $0 < x < 2$

76. If $f'(x) = \sqrt{1+2x^3}$ and $f(2) = 0.4$, then $f(5) =$

(A) 29.005 (B) 28.605 (C) 28.205 (D) -28.205

x	-0.2	0	0.2	0.4
$f'(x)$	0.8	1.2	1.7	2.3

77. The table above shows values of f', the derivative of a function f, for selected values of x. If $f(-0.2) = 1$, what is the approximation for $f(0.4)$ obtained by using Euler's method with a step size of 0.2 starting at $x = -0.2$?

(A) 1.48 (B) 1.74 (C) 2.04 (D) 2.20

83. What is the area enclosed by the curves $y = x^3 - 8x^2 + 18x - 5$ and $y = x + 5$?

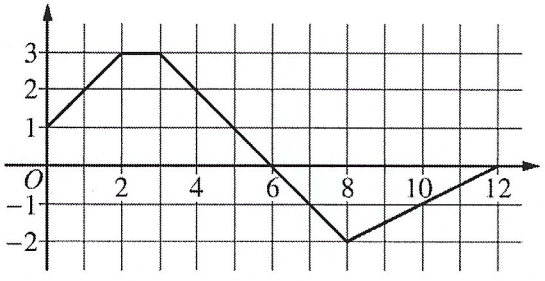
(A) 10.667

(B) 11.833

(C) 14.583

(D) 21.333

(E) 32



Graph of f

85. The graph of the function f is shown above. If g is the function defined by $g(x) = \int_2^x f(t)\,dt$, what is the value of $g(10) \cdot g'(10)$?

(A) $\frac{25}{4}$ (B) $\frac{5}{4}$ (C) $-\frac{5}{2}$ (D) $-\frac{25}{2}$

92. Let R be the region in the first quadrant bounded below by the graph of $y = x^2$ and above by the graph of $y = \sqrt{x}$. R is the base of a solid whose cross sections perpendicular to the x-axis are squares. What is the volume of the solid?

(A) 0.129 (B) 0.300 (C) 0.333 (D) 0.700 (E) 1.271