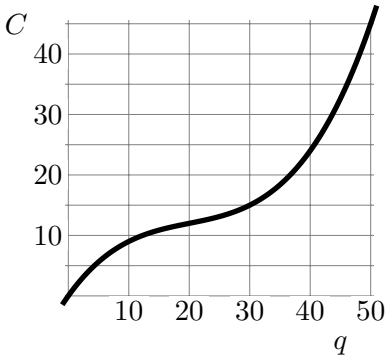
Name: _____

1. A graph of the total cost function $C(q)$ (in thousands of dollars) appears below.

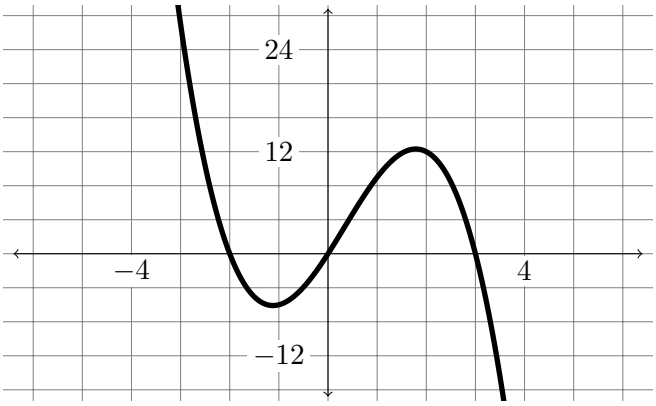


(a) [**3 points**] Estimate the production level that minimizes marginal cost.

(b) [**3 points**] Estimate the production level that minimizes average cost.

2. [**7 points**] The cost of producing q units is given by $C(q) = 9q^3 - 225q^2 + 6875q$. Find the production level that minimizes average cost exactly.

3. [**7 points**] Use the graph of $f(t)$ to estimate the value of the integral $\displaystyle\int_{-2}^{3} f(t)\,dt$.



4. [**8 parts, 3 points each**] Evaluate the following indefinite integrals.

(a) $\int 6\,dx$

(b) $\int z - 3z^2\,dz$

(c) $\int 2x^6(3x+1)\,dx$

(d) $\int e^{7t}\,dt$

(e) $\int \frac{1}{x^8}\,dx$

(f) $\int r^{11+\sqrt{2}}\,dr$

(g) $\int e^3 x\,dx$

(h) $\int x^{-1}\,dx$

5. [**2 parts, 5 points each**] Evaluate the following indefinite integrals.

(a) $\displaystyle\int \frac{4x^3+3}{(x^4+3x+8)^5}\,dx$

(b) $\displaystyle\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx$

6. [**6 points**] Find the average value of the function $f(x) = x(4-x)$ over the interval $[0,4]$ exactly.

7. [**4 parts, 5 points each**] Use the Fundamental Theorem of Calculus to solve the following definite integrals exactly.

(a) $\displaystyle\int_{-2}^{1} 3x^2\,dx$

(b) $\displaystyle\int_{2}^{4} t^3 - e^{2t}\,dt$

(c) $\displaystyle\int_{2}^{5} \frac{(\ln x)^2}{x}\,dx$

(d) $\displaystyle\int_{0}^{1} (x + e^{2x})(x^2 + e^{2x})^{10}\,dx$

8. [**4 parts, 3 points each**] At time $t = 0$ hours, the surface of a pond begins to freeze. The rate R (in inches per hour) of growth in ice is a function $R(t)$ of time.

t	0	1	2	3	4	5	6	7	8
$R(t)$	0	0.5	1	2	1.5	1	0.5	0.25	0.5

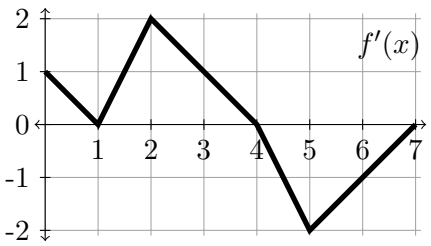
(a) Express the total change in the thickness of the ice during the first 8 hours as a definite integral.

(b) With $n = 4$, find the Left Hand Sum (LHS) approximation to the above integral.

(c) With $n = 8$, find the Left Hand Sum (LHS) approximation to the above integral.

(d) Which of these estimates would you expect to be more accurate? Briefly explain.

9. [**8 points**] The graph of the derivative $f'(x)$ is shown below. Fill in the table of values given that $f(0) = 4$.



x	0	1	2	3	4	5	6	7
$f(x)$	4							