

VISUAL 9.1 ▲ Warm-Up

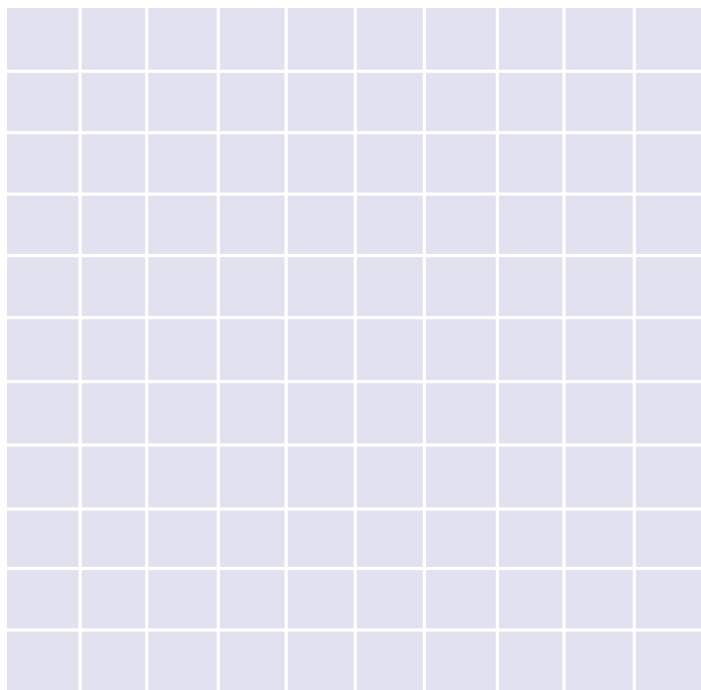
Given $f(x) = -2x^3 + 3x^2 + 36x - 14$

1. Find the first derivative of $f(x)$.
2. Find all critical values of $f(x)$.
3. Test the sign of $f'(x)$ in each interval created by the critical values. Use the table below.

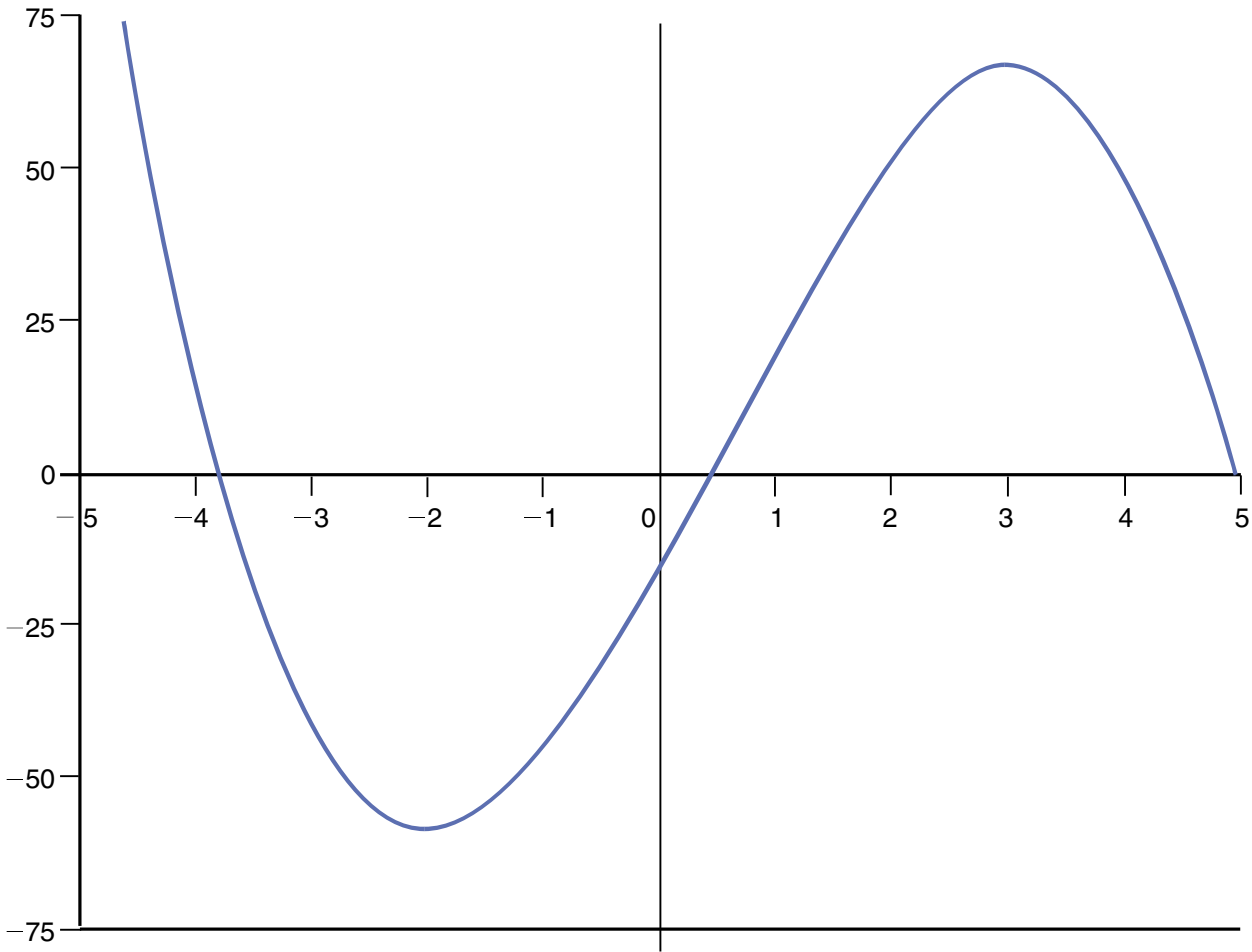
Interval			
Test point in interval			
Sign of $f'(x)$ in interval			

4. Which critical value is associated with a relative maximum point? Explain your answer.
5. Verify your conclusion to the preceding question by finding $f''(x)$. Explain your answer.

6. Sketch $f(x)$ on the graph for the domain $-5 < x < 5$ and the range $-75 \leq y \leq 75$. Plot the vertical scale in 25-unit increments and the horizontal scale in one-unit increments. Use all four quadrants.



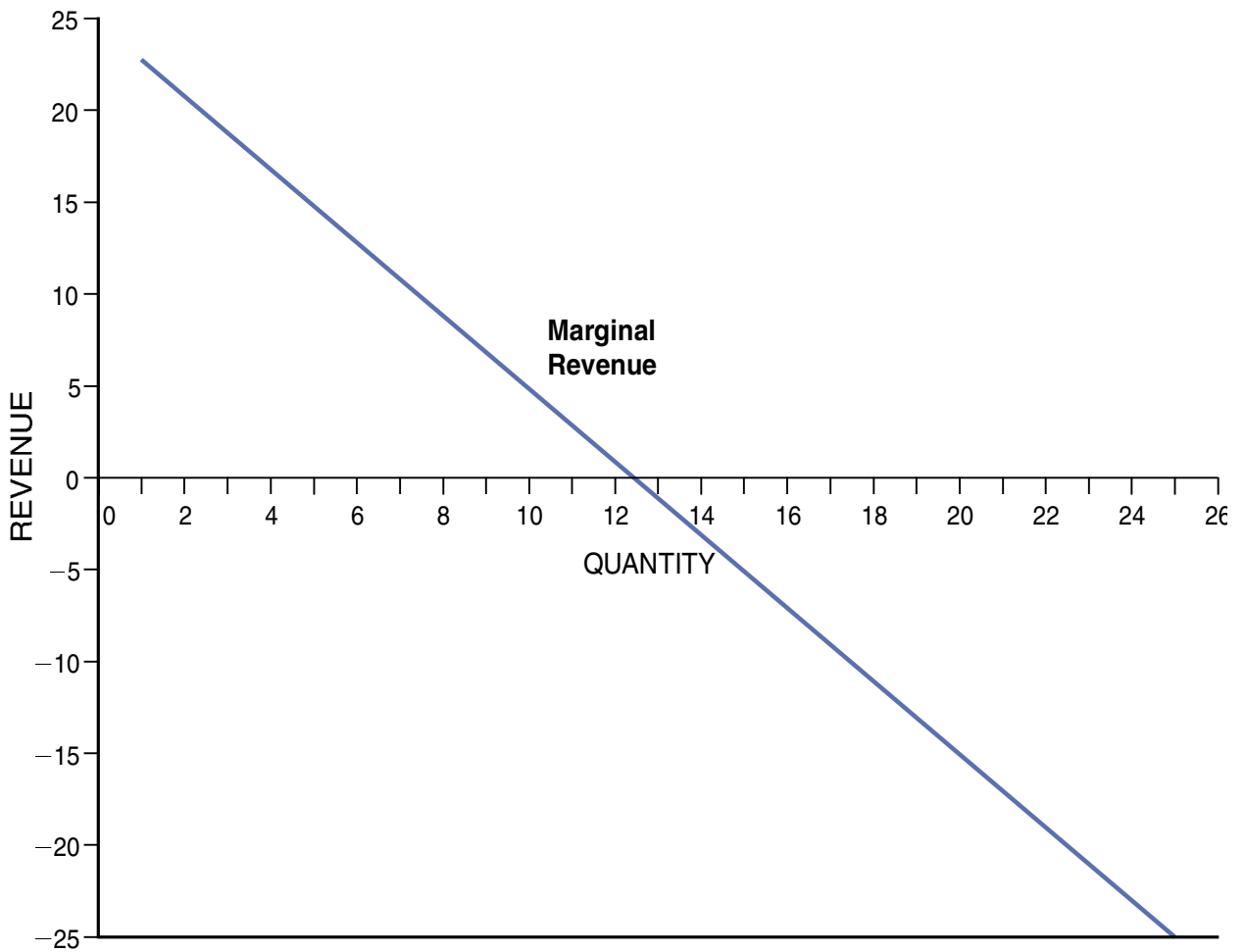
VISUAL 9.2 ▲ Graph for Warm-Up Activity



VISUAL 9.3 ▲ Calculating Total Revenue and Marginal Revenue

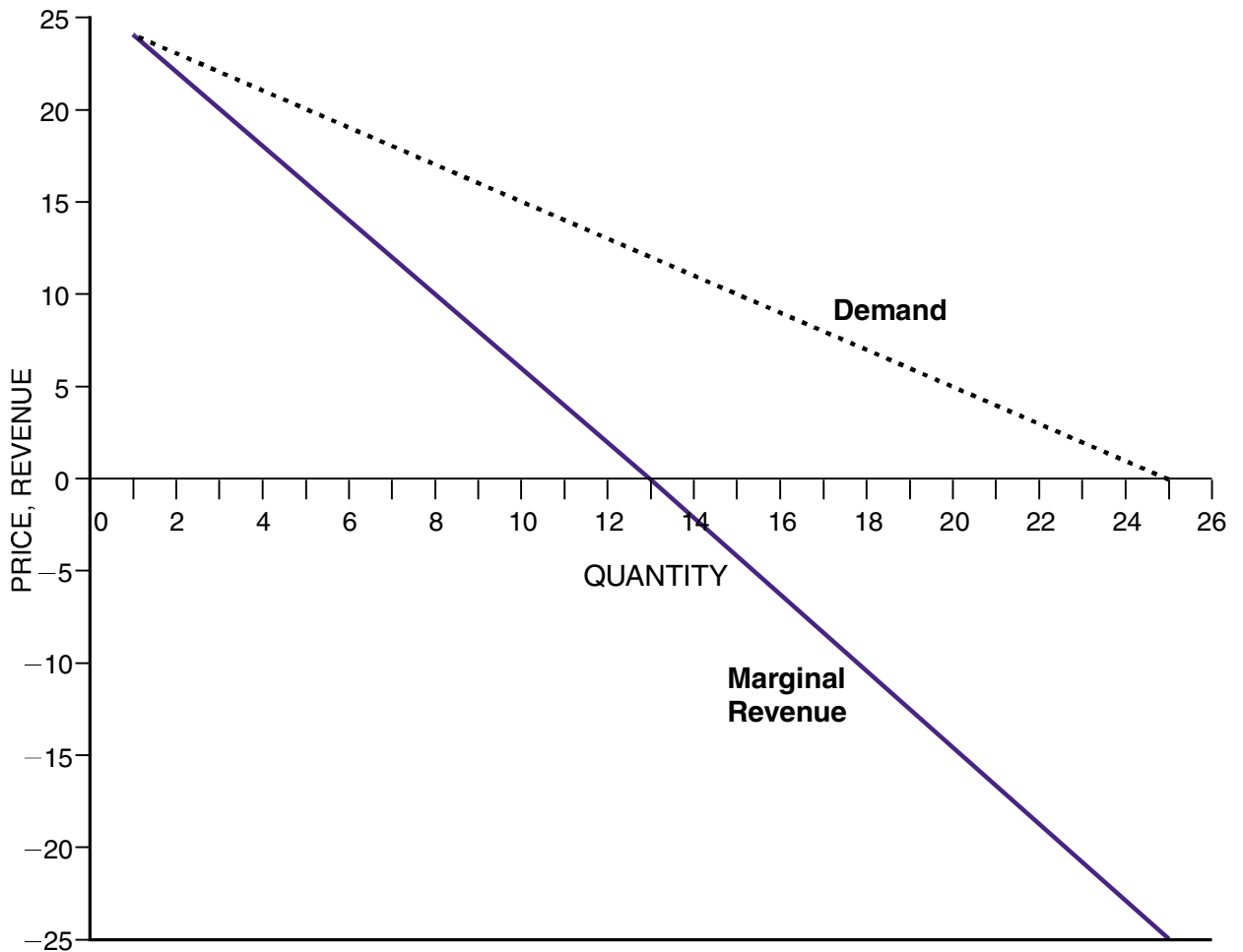
Price in \$ (P)	Quantity Demanded (Q)	(Price)(Quantity) = Total Revenue (TR)	Δ Total Revenue/ Δ Quantity = Marginal Revenue (MR)
25	0	0	
24	1	24	24
23	2	46	22
22	3	66	20
21	4	84	18
20	5	100	16
19	6	114	14
18	7	126	12
17	8	136	10
16	9	144	8
15	10	150	6
14	11	154	4
13	12	156	2
12	13	156	0
11	14	154	-2
10	15	150	-4
9	16	144	-6
8	17	136	-8
7	18	126	-10
6	19	114	-12
5	20	100	-14
4	21	84	-16
3	22	66	-18
2	23	46	-20
1	24	24	-22
0	25	0	-24

VISUAL 9.4 ▲ Marginal Revenue Curve



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VISUAL 9.5 ▲ Marginal Revenue Curve with Demand Curve



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VISUAL 9.6 ▲ Calculating Total Cost and Marginal Cost

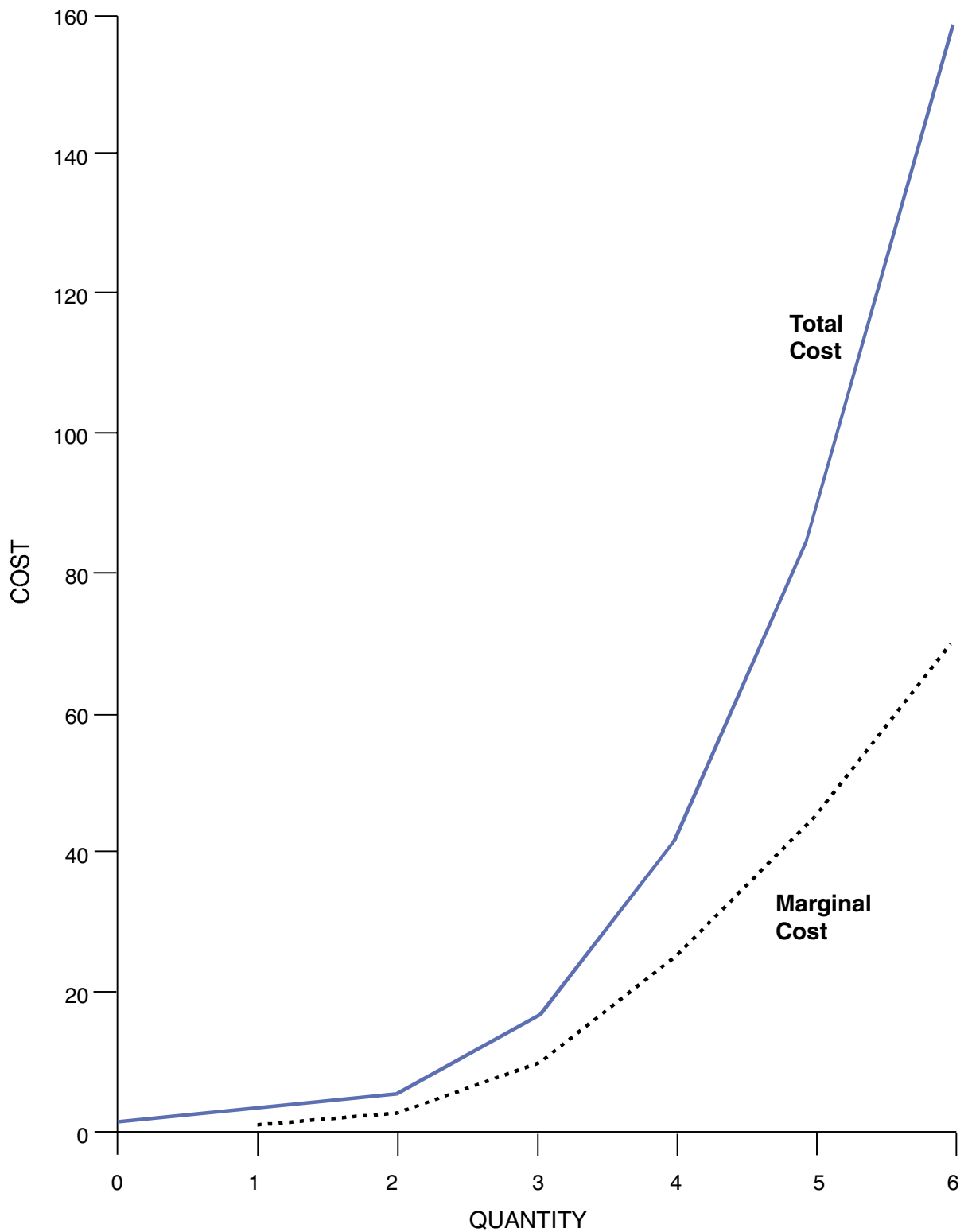
You are given the following total cost function:

$$\text{Total Cost} = Q^3 - 2Q^2 + 2Q + 2$$

Output (Q)	Total Cost (TC)	Marginal Cost (MC)
0	\$2	
1	\$3	\$1
2	\$6	\$3
3	\$17	\$11
4	\$42	\$25
5	\$87	\$45
6	\$158	\$71

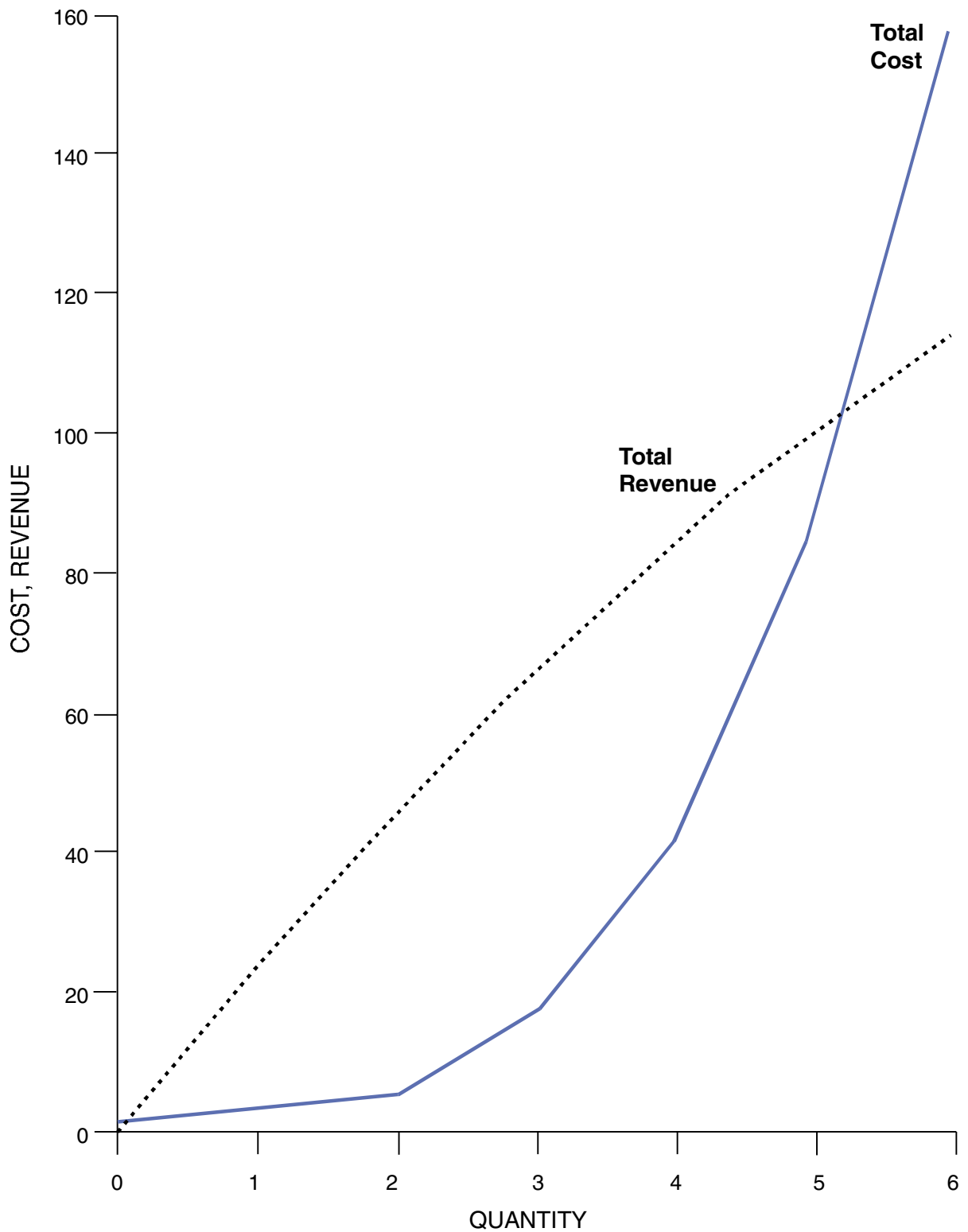
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VISUAL 9.7 ▲ Total Cost and Marginal Cost Curves



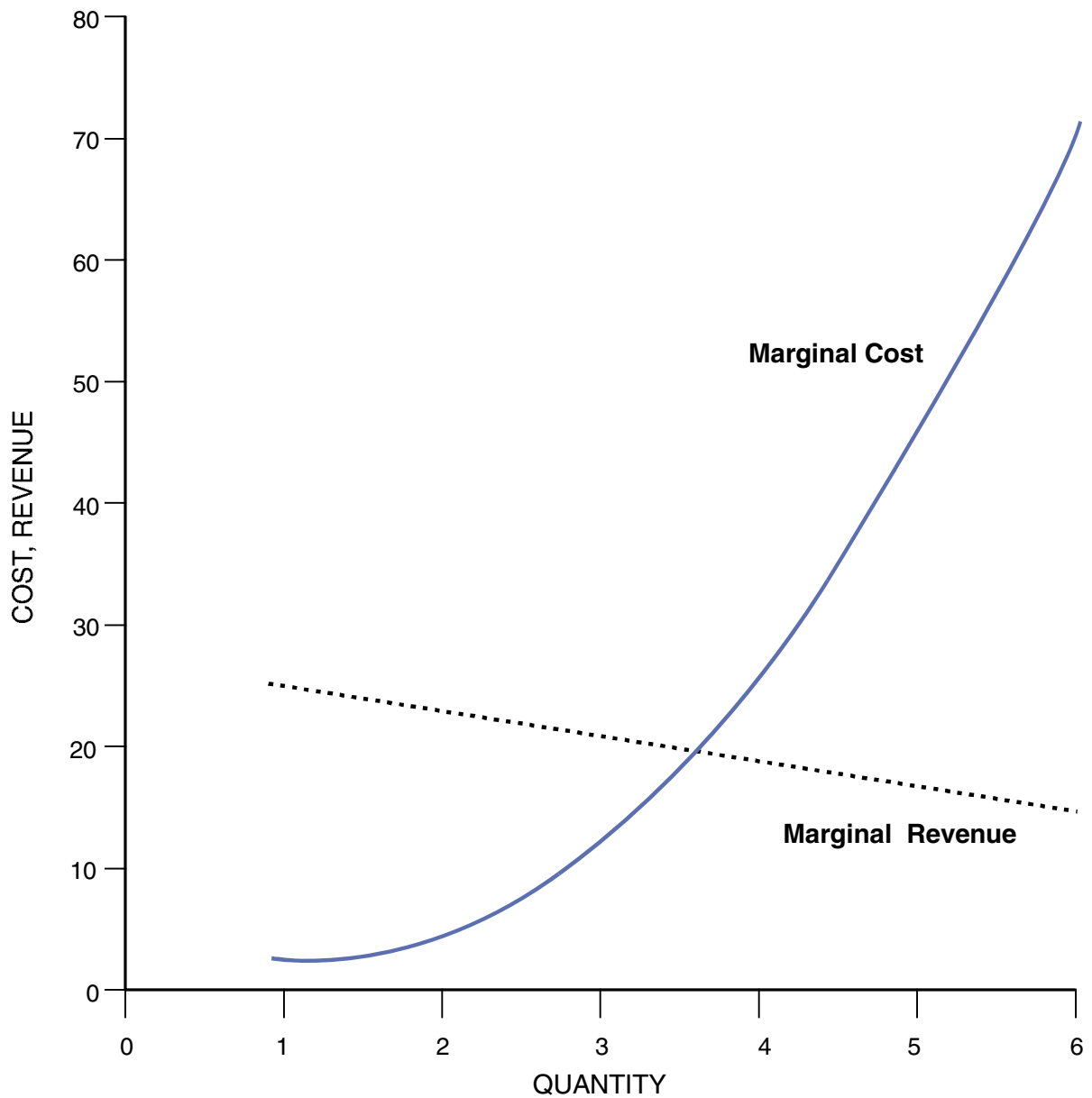
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VISUAL 9.8 ▲ Total Cost and Total Revenue Curves



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VISUAL 9.9 ▲ Marginal Cost and Marginal Revenue Curves



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VISUAL 9.10 ▲ Blunders in Economics and Mathematics The Design of the B-2 Stealth Bomber

According to an article published in *Science* magazine,* an engineering professor alleges that the B-2 Stealth Bomber, with its volume disproportionately placed on the wing of the aircraft to achieve its “flying wing” design, is the worst possible configuration for the aircraft. This is because the study that was used to design the B-2 bomber relied upon early research in which a minimum point was mistaken for a maximum point. This occurred, it is alleged, because the original designers of “flying wing” aircraft failed to calculate the second derivative of the mathematical formula ultimately used in the design of the B-2 bomber. Instead of maximizing the range of the Stealth bomber, the designers thus configured an aircraft in such a way as to *minimize* its range. Think of this the next time you see a photo of the B-2 Stealth Bomber. Its peculiar design may well belie one of the great mathematical blunders of all time—mistaking a minimum point for a maximum point!

* See Wayne Biddle, “Skeleton Alleged in the Stealth Bomber’s Closet.” *Science*, May 12, 1989, p. 650.