Integration - Practice test 2

Name: _____ Date: _____

10 questions | 50 marks | 70 minutes

A second balanced paper with flow, cost and graphical reasoning.

A scientific calculator may be used.

1. Powers and constants. [4 marks]

(a) Find $\int(6x^2 + 4x - 3)\,dx$. [2 marks]

(b) Explain why different constants give the same derivative. [2 marks]

2. Exponential and trigonometric forms. [4 marks]

(a) Find $\int 5e^{-x}\,dx$. [2 marks]

(b) Find $\int 6\sin(3x)\,dx$. [2 marks]

3. $g'(x) = \frac{2}{x}$ on $x > 0$, with $g(e) = 5$. [4 marks]

(a) Find g. [2 marks]

(b) Find $g(1)$. [2 marks]

4. A tank starts with 60 L. Its inflow is $9 + t$ L/min and outflow 4 L/min for 0 to 4 min. [6 marks]

(a) Write and evaluate the integral for net change. [2 marks]

(b) Find the final volume. [2 marks]

(c) Find the total inflow. [2 marks]

5. For $f(x) = x^2$ on $[0, 2]$, use two equal strips. [6 marks]

(a) Find the left-rectangle estimate. [2 marks]

(b) Find the right-rectangle estimate. [2 marks]

(c) Explain why the exact integral lies between them. [2 marks]

6. $B(x) = \int_1^{x^2} (t + 2)\, dt$. [4 marks]

(a) Find $B'(x)$. [2 marks]

(b) Evaluate $B(1)$. [2 marks]

7. The curve $y = 2 - x$ is considered on $[0, 5]$. [6 marks]

(a) Find its zero. [2 marks]

(b) Find signed integral and geometric area. [4 marks]

8. Find the region between $y = 4$ and $y = x^2$. [5 marks]

(a) Find the bounds. [2 marks]

(b) Calculate its area. [3 marks]

9. A production-cost model has $C'(q) = 0.06q + 4$ dollars/item and $C(0) = 80$ dollars. [6 marks]

(a) Find $C(q)$. [2 marks]

(b) Find the cost of producing 10 items. [2 marks]

(c) Explain what $\int_{10}^{20} C'(q)\,dq$ measures. [2 marks]

10. A particle has $v(t) = 2t - 4$ m/s on $[0, 4]$. [5 marks]

(a) Find its displacement. [2 marks]

(b) Find its distance. [3 marks]