Practice Assessment Task
SET 1

1. Prove that the opposite sides of a parallelogram are equal.

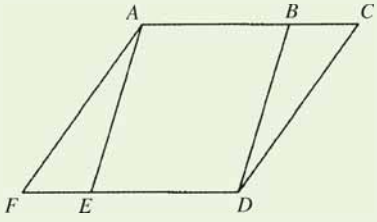
2. Find all values of x for which the curve $y = (2x - 1)^2$ is decreasing.

3. Find $\int (3x^2 - 2x + 1)\, dx$.

4. Find the maximum value of the curve $y = x^2 + 3x - 4$ in the domain $-1 \leq x \leq 4$.

5. The area of a rectangle is 4 m^2. Find its minimum perimeter.

6. Show that $ABDE$ is a parallelogram, given that $ACDF$ is a parallelogram and $BC = FE$.



7. Find the primitive function of $3x^8 + 4x$.

8. Sketch the curve $y = x^3 - 3x^2 - 9x + 2$, showing all stationary points and inflexions.

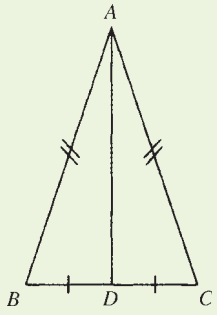
9. Find the volume of the solid of revolution formed when the curve $y = x^3 + 1$ is rotated about
   (a) the x-axis from $x = 0$ to $x = 2$
   (b) the y-axis from $y = 1$ to $y = 9$.

10. Find the area enclosed between the curve $y = x^2 - 1$ and the x-axis.

11. If $f(x) = x^3 - 2x^2 + 5x - 9$, find $f'(3)$ and $f''(-2)$.

12. Evaluate $\int_1^3 (6x^2 + 4x)\, dx$.

13. ABC is an isosceles triangle with D the midpoint of BC. Show that AD is perpendicular to BC.



14. Find the volume of the solid of revolution formed, correct to 3 significant figures, if $y = x^2 + 2$ is rotated about
   (a) the x-axis from $x = 0$ to $x = 2$
   (b) the y-axis from $y = 2$ to $y = 3$.

15. Find the domain over which the curve $y = 3x^3 + 7x^2 - 3x - 1$ is concave upwards.

16. If $f(x) = 2x^4 - x^3 - 7x + 9$, find $f(1), f'(1), f''(1)$. What is the geometrical significance of these results? Illustrate by a sketch of $y = f(x)$ at $x = 1$.

17. A piece of wire of length 4 m is cut into 2 parts. One part is bent to form a rectangle with sides x and $3x$, and the other part is bent to form a square with sides y. Prove that the total area of the rectangle and square is given by $A = 7x^2 - 4x + 1$, and find the dimensions of the rectangle and square when the area has the least value.

18. The gradient function of a curve is given by $f'(x) = 4x - 3$. If $f(2) = -3$, find $f(-1)$.

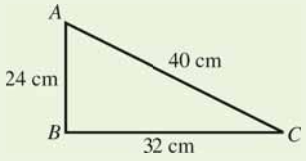
19. Evaluate $\int_0^3 (2x + 1)\,dx$.

20. The following table gives values for $f(x) = \frac{1}{x^2}$.

x	1	2	3	4	5
$f(x)$	1	$\frac{1}{4}$	$\frac{1}{9}$	$\frac{1}{16}$	$\frac{1}{25}$

Use the table together with Simpson's rule to evaluate $\int_1^5 \frac{dx}{x^2}$ correct to 3 significant figures.

21. Show that ΔABC is right angled at $\angle B$.



22. Find $\int (3x + 5)^7\,dx$.

23. Evaluate $\int_0^2 (x^2 + x - 5)\,dx$.

24. Find the point of inflexion on the curve $f(x) = x^3 - 3x^2 + 4x - 1$.

25. Find an approximation to $\int_1^3 \frac{dx}{x}$ by using
(a) Simpson's rule with 3 function values
(b) the trapezoidal rule with 2 subintervals.

26. Find the stationary points on the curve $f(x) = x^4 - 2x^2 + 3$ and distinguish between them.

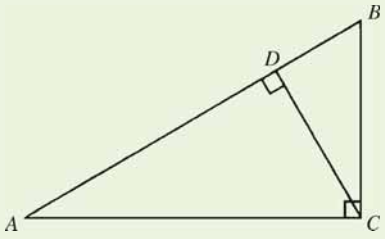
27. Evaluate $\int_1^2 \sqrt{5x - 1}\,dx$ as a fraction.

28. (a) Find the area enclosed between the curve $y = x^2 - 1$ and the y-axis between $y = 1$ and $y = 2$ in the first quadrant, to 3 significant figures.
(b) This area is rotated about the y-axis. Find the exact volume of the solid formed.

29. Evaluate $\int_4^9 \sqrt{y}\,dy$.

30. Find the area enclosed between the curve $y = (x - 1)^2$ and the line $y = 4$.

31. Prove ΔABC and ΔCBD are similar.



32. Show that the curve $y = 2x^4$ has a minimum turning point at $(0, 0)$.

33. Find the maximum volume of a rectangular prism with dimensions x, $2x$ and y and whose surface area is 12 m^2.

34. If a function has a stationary point at $(-1, 2)$ and $f''(x) = 2x - 4$, find $f(2)$.

35. Find the area enclosed between the curves $y = x^2$ and $y = -x^2 + 2x + 4$.

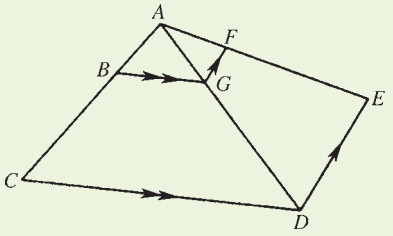
36. Find the minimum surface area of a closed cylinder with volume 100 m^3, correct to 1 decimal place.

37. A curve has a stationary point at $(3, 2)$. If $f''(x) = 6x - 8$, find the equation of the function.

38. Sketch the function $f(x) = x^3 - 3x^2 - 9x + 5$, showing any stationary points and inflexions.

39. Prove that the area of a rhombus is $A = \frac{1}{2}xy$ where x and y are the lengths of the diagonals.

40.

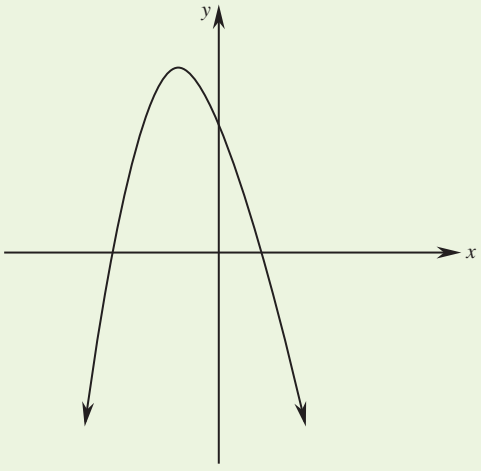


Given $BG \parallel CD$ and $GF \parallel DE$, prove $\frac{AB}{AC} = \frac{AF}{AE}$.

41. Given $f'(x) = x^2 - 2x - 1$, evaluate $f(2)$ if $f(0) = 5$.

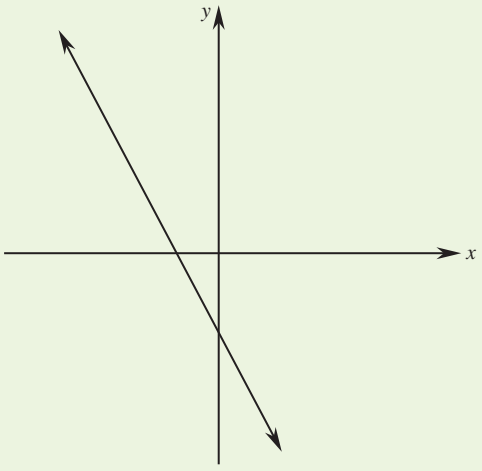
42. (a) Complete the statement: The primitive function of $x^n = \ldots$
(b) Explain why there is a constant C in the primitive function.

43. The graph below is the derivative of a function.



Which graph could represent the function? There may be more than one answer.

(a)



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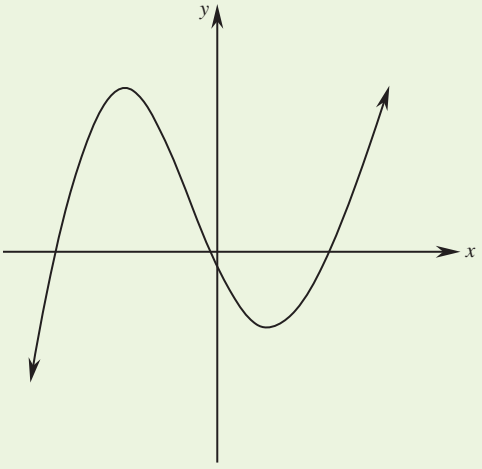

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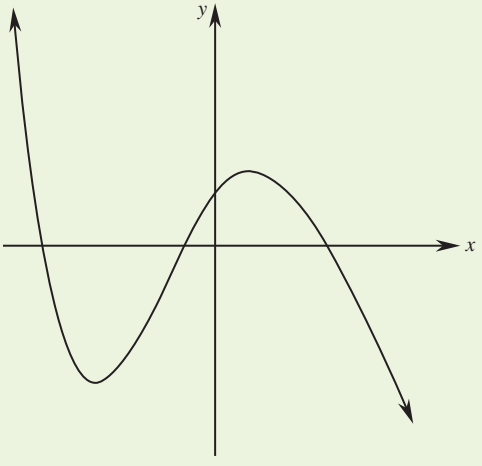

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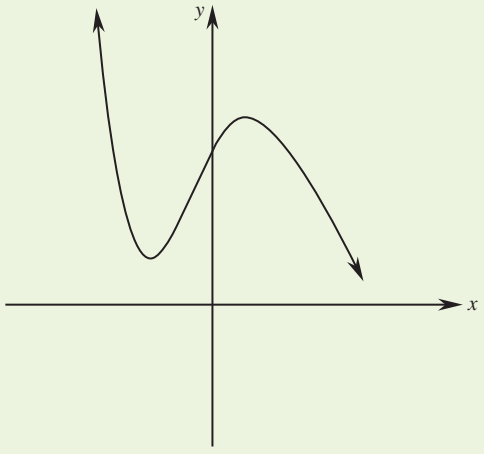
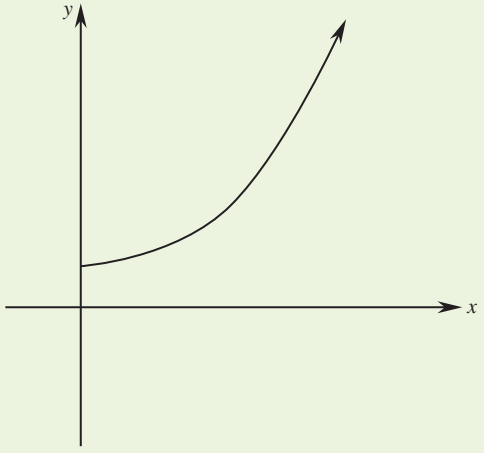


44. A function has $\frac{dy}{dx} > 0$. To which of the following graphs does this apply?

(a)



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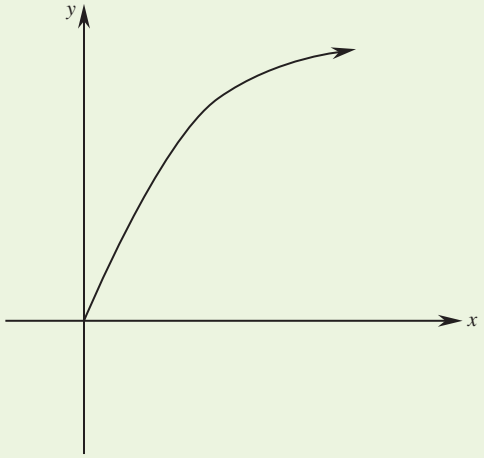

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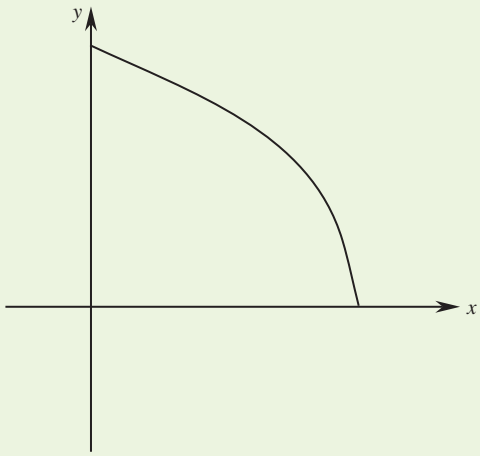
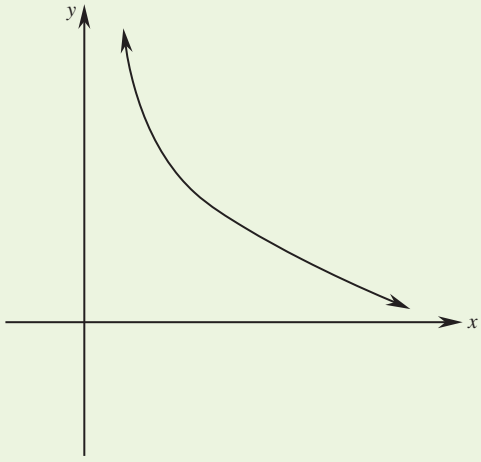


(d)



45. The area of a rectangle with sides x and y is 45. The perimeter is given by:

(a) $P = x + 45x^2$

(b) $P = x + \frac{45}{x}$

(c) $P = 2x + \frac{90}{x}$

(d) $P = 2x + \frac{45}{x}$

46. The area enclosed between the curve $y = x^3 - 1$, the y-axis and the lines $y = 1$ and $y = 2$ is given by

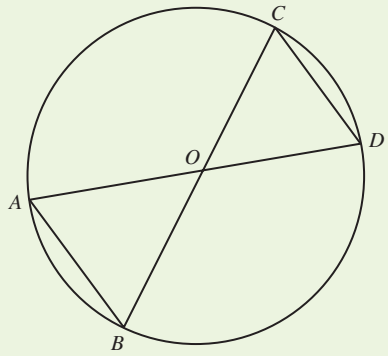
(a) $\int_1^2 (x^3 - 1)\,dy$

(b) $\int_1^2 (y + 1)\,dy$

(c) $\int_1^2 (\sqrt[3]{y} + 1)\,dy$

(d) $\int_1^2 (\sqrt[3]{y + 1})\,dy$

47.



Given O is the centre of the circle, triangles OAB and OCD can be proven to be congruent using the test

(a) *SSS*

(b) *SAS*

(c) *AAS*

(d) *RHS*.

48. The area bounded by the curve $y = x^3$, the x-axis and the lines $x = -2$ and $x = 2$ is

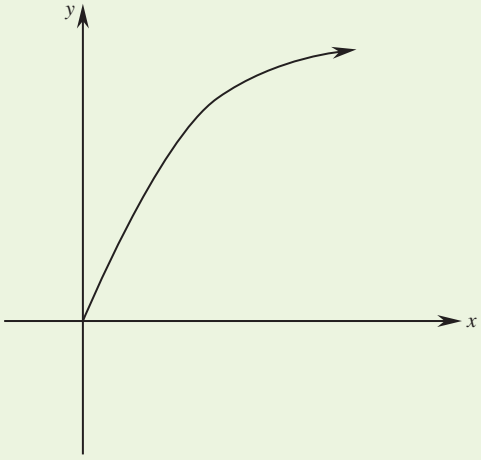
(a) 8 units^2

(b) 2 units^2

(c) 0 units^2

(d) 4 units^2.

49.



The curve has

(a) $\frac{dy}{dx} > 0, \frac{d^2y}{dx^2} > 0$

(b) $\frac{dy}{dx} > 0, \frac{d^2y}{dx^2} < 0$

(c) $\frac{dy}{dx} < 0, \frac{d^2y}{dx^2} > 0$

(d) $\frac{dy}{dx} < 0, \frac{d^2y}{dx^2} < 0$

50. A cone with base radius r and height h has a volume of 300 cm^3. Its slant height is given by

(a) $l = \sqrt{\frac{\pi h^3 + 900}{\pi h}}$

(b) $l = \sqrt{\frac{h^2 + 900}{\pi h}}$

(c) $l = \sqrt{\frac{h^2 + 810\,000}{\pi h}}$

(d) $l = \sqrt{\frac{\pi h^3 + 900}{\pi h}}$