



Name:

Class:

2020

Year 12 Mathematics Advanced Assessment Task 2

General Instructions:

- Working time – 55 minutes
- Write using black pen
- Only NESA approved calculators may be used
- A reference sheet is provided
- In Questions 11 – 13, show ALL relevant mathematical reasoning and/or calculations in the space provided

Total Marks:

Section I – 10 marks (pages 1–4)

- Attempt Questions 1 – 10
- Allow about 15 minutes for this section

Section II – 24 marks (pages 5–9)

- Attempt Questions 11 – 13
- Allow about 40 minutes for this section

Marks:

Section I	Q11	Q12	Q13	TOTAL
/10	/6	/11	/7	/34

Feedback:

Section I

10 marks

Attempt Question 1-10 using the multiple choice answer sheet

Allow about 15 minutes for this section

Question 1: What are the x -coordinates of the two stationary points on the curve $y = 5 + 3x^3 - 2x^4$?

A. $x = 0, x = \frac{2}{3}$

B. $x = 0, x = \frac{3}{2}$

C. $x = 0, x = \frac{8}{9}$

D. $x = 0, x = \frac{9}{8}$

Question 2: What is the derivative of $\ln(\cos x)$?

A. $-\sec x$

B. $-\tan x$

C. $\sec x$

D. $\tan x$

Question 3: What values of x is the curve $f(x) = 2x^3 + x^2$ concave down?

A. $x < -\frac{1}{6}$

B. $x > -\frac{1}{6}$

C. $x < -6$

D. $x > -6$

Question 4: The graph $y = f(x)$ passes through the point (1,4) and $f'(x) = 3x^2 - 2$.

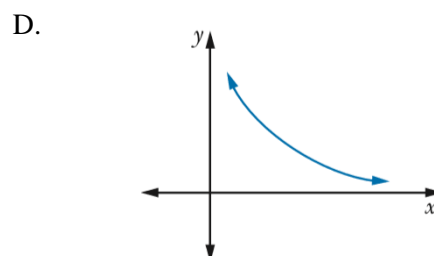
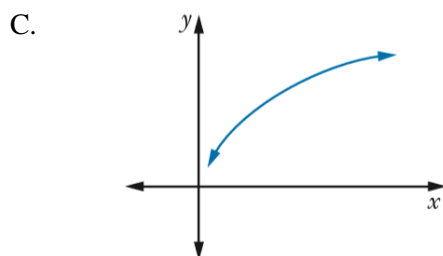
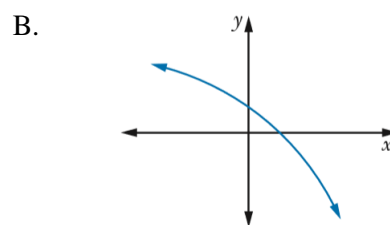
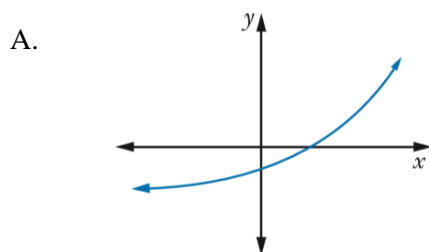
Which of the following expressions is $f(x)$?

- A. $x^3 - 2x$
- B. $2x - 1$
- C. $x^3 - 2x + 1$
- D. $x^3 - 2x + 5$

Question 5: Which of the following is an expression for $\frac{dy}{dx}$ if $y = e^{x^2+1}$

- A. $\frac{dy}{dx} = 2x$
- B. $\frac{dy}{dx} = e^{2x}$
- C. $\frac{dy}{dx} = 2xe^{x^2}$
- D. $\frac{dy}{dx} = 2xe^{x^2+1}$

Question 6: Which graph represents a curve that is increasing at a decreasing rate?



Question 7: A pendulum has acceleration given by $a = -4 \cos 2t$. Which equation represents the velocity of the curve?

- A. $v = -4 \sin 2t + c$
- B. $v = 2 \sin 2t + c$
- C. $v = -2 \sin 2t + c$
- D. $v = 4 \sin 2t + c$

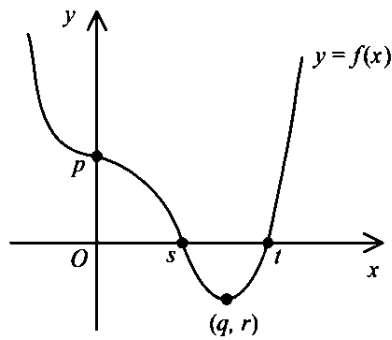
Question 8: Using the trapezoidal rule with 4 subintervals, which expression gives the approximate area under the curve $y = xe^x$ between 1 and 3?

- A. $\frac{1}{4}(e^1 + 6e^{1.5} + 4e^2 + 10e^{2.5} + 3e^3)$
- B. $\frac{1}{4}(e^1 + 3e^{1.5} + 4e^2 + 5e^{2.5} + 3e^3)$
- C. $\frac{1}{2}(e^1 + 6e^{1.5} + 4e^2 + 10e^{2.5} + 3e^3)$
- D. $\frac{1}{2}(e^1 + 3e^{1.5} + 4e^2 + 5e^{2.5} + 3e^3)$

Question 9: The graph of $y = f(x)$ shown has stationary points at $(0, p)$ and (q, r) .

Here are two statements about $f(x)$:

- (i) $f(x) < 0$ for $s < x < t$
- (ii) $f'(x) < 0$ for $x < q$



Which of the following is true?

- A. Neither statement is correct
- B. Only statement (i) is correct
- C. Only statement (ii) is correct
- D. Both statements are correct

Question 10: The primitive function of $x + \frac{1}{x}$ is:

- A. $1 - \frac{1}{x^2}$

B. $x^2 + \sqrt{x} + C$

C. $1 + \frac{1}{x^2}$

D. $\frac{x^2}{2} + \ln|x| + C$

End of Section I

Section II

24 marks

Attempt Question 11-13 in the writing space provided for you

SHOW ALL WORKING OUT

Allow about 40 minutes for this section

Question 11 (6 marks)

- a) Given that $f(x) = (-x^2 + 1)(x + 4)$, evaluate $f''(2)$. **3**

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- b) Differentiate and simplify $(x) = \frac{x}{2\tan(3x^2+1)}$. **3**

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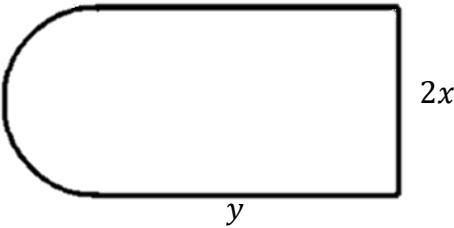
Question 12 (11 marks)

- a) Sketch the graph of $f(x) = 2 + 3x^2 - x^3$ clearly showing any turning points, points of inflections and the y -intercept **4**

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- b) Lily’s rabbit hutch is in the shape of a rectangle and a semi-circle as shown. The perimeter is to be 4 metres.



- i) Show that $y = 2 - x - \frac{\pi x}{2}$ 2

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- ii) Show that the area of the hutch can be expressed as $A = 4x - 2x^2 - \frac{\pi x^2}{2}$ 2

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- iii) Find the maximum area of her rabbit pen correct to 2 decimal places 3

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Question 13 (7 marks)

- a) Integrate $x^2(x^3 + 1)^{10}$ with respect to x

2

b) Find the value of a given $\int_5^a \frac{x-1}{x^2-2x} dx = \frac{1}{2} \ln \frac{7}{3}$ and $a > 0$ **5**

Name:

Class:

Multiple Choice Answer Sheet

Use this multiple-choice answer sheet for Questions 1–10.

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|-----|-------------------------|-------------------------|-------------------------|-------------------------|
| 1. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 2. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 3. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 4. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 5. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 6. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 7. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 8. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 9. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 10. | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |