

Time:	25 minutes
Total Marks:	25 marks

Year 12 Test 2

Thursday 29th April 2021

Resource Free

ClassPad calculators are Not permitted.
Formulae Sheet is Permitted.

Name:

1. (2 , 2 = 4 marks)
- Differentiate the following with respect to x . Do not simplify.
- a) $3x^2e^x$
- b) $3e^{2x^3+1}$

9. (3, 2, 3, 1 = 9 marks)
- A particle's is moving with rectilinear motion and its position can be modelled by the function $v(t) = 3t^2 - 12t + 9$ for $0 \leq t \leq 4$, where v is measured in metres/seconds and t is measured in seconds.
- a) Determine when the velocity of the particle is maximised.

- b) If the particle is initially at the origin determine an expression for the displacement.

- c) Determine the total distance travelled in the first 3 seconds.

- d) Determine the change in displacement in the 2nd second.

2. (2, 2, 2, 1 = 7 marks)

a) Evaluate the following $\int \frac{\sqrt{x}+x}{x} dx$.

b) Find Q in terms of p given that $\frac{dQ}{dp} = 4 - \frac{6}{p^3}$ and $Q = -3$ when $p = 1$.

c) $\int 2x^3 e^{x^4} dx$

d) $\frac{d}{dx} \int_{-2}^x \frac{t^2+3}{\pi-\sqrt{t}} dt$

7. (1, 2 = 3 marks)

A population changes such that $\frac{dP}{dt} = -0.12P$, where t is in years.

a) Is the the population growing or decaying?

b) If the population is 120 000 after 8 years. Calculate (to the nearest 1000) the original population.

8. (4 marks)

Given $f(x) = e^x$ and $g(x) = e^{-x}$ find the **exact** area of the regions enclosed by the two functions, $x = -1$ and $x = 1$. Show the use of a sketch in your solution.



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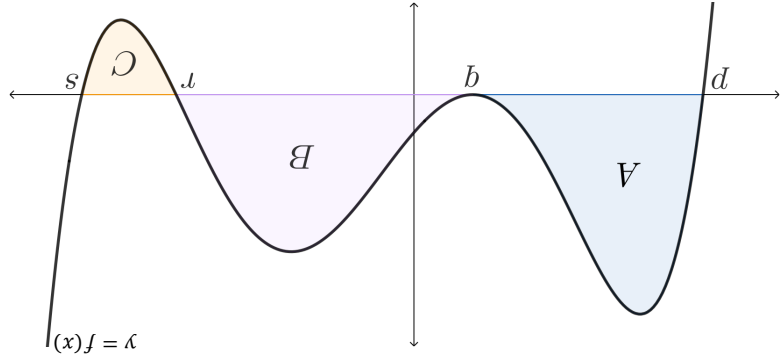
Time:	20 minutes
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6. (2, 2 = 4 marks)
- An imaginary radioactive isotope Cororonium decays at a rate of $\frac{dA}{dt} = -0.14A$ where A (kg) is the amount of Cororonium remaining and t is in years.
- a) If 2 kg of Cororonium exists originally, determine how much will remain after 10 years.
- b) Determine the half life of Cororonium, that is the time it takes for the radioactive isotope to be reduced to 50%.

a) $\int_s^d f(x) dx$

b) $\int_s^d 2f(x) dx$

c) $\int_p^t f(x) + 1 dx$

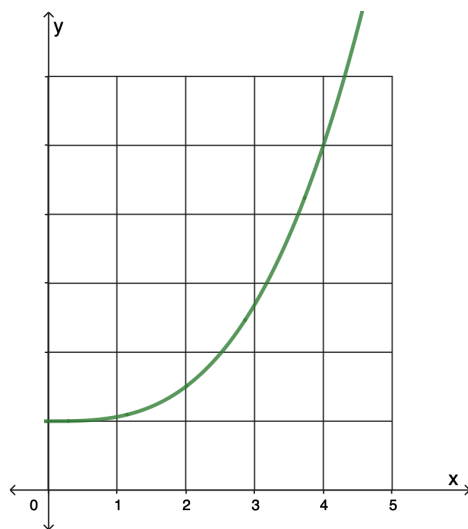


3. (1, 1, 2 = 4 marks)
- The three regions between the curve $y = f(x)$ and the x-axis have areas of A , B , and C units² as shown below. Determine the following definite integrals.

4. (2, 2 = 4 marks)

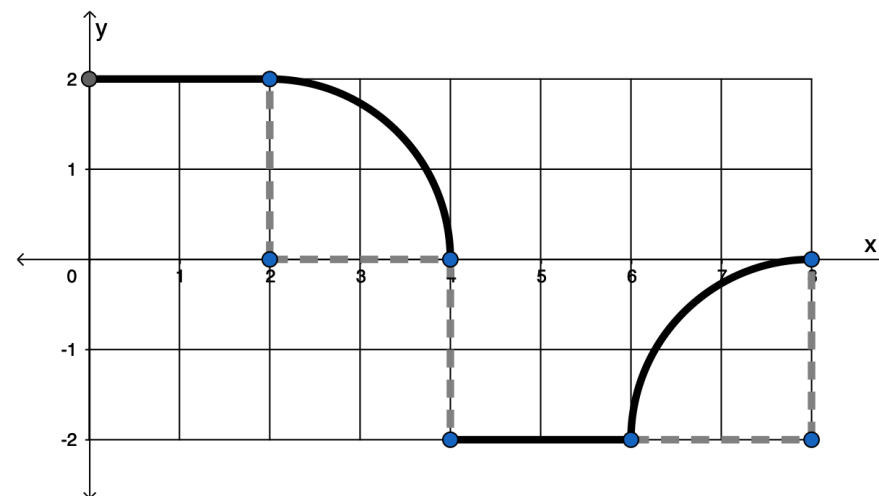
The function $f(x) = x^3 + 1$ is shown below.

- a) Using the under-estimate with widths of 1 unit, approximate the area under $f(x)$ for $1 \leq x \leq 3$. Show all working.



- b) Combine your under-estimate from part a) and the over-estimate value to get a better approximation for the integral $\int_1^3 x^3 dx$.

5. (2, 2, 2 = 6 marks)



The function $f(x)$ is shown below.

- a) Use the graph above to determine the following in exactly.

i. $\int_0^4 f(x) dx$

y

ii. $\int_4^8 f(x) dx$

iii. If $\int_k^8 f(x) dx = 0$, solve for k .