

Name:

7-9 Homework: Mixed Calculus - without calculator

[58 marks]

1. 12M.1.sl.TZ1.3

[6 marks]

Let $f(x) = e^{6x}$.

(a) Write down $f'(x)$

[1]

(b) The tangent to the graph of f at the point $P(0, b)$ has gradient m .

[4]

i. Show that $m = 6$.

ii. Find b .

(c) Hence, write down the equation of this tangent.

[1]

2. 09M.1.sl.TZ1.3

[6 marks]

Let $f(x) = e^x \cos x$. Find the gradient of the normal to the curve of f at $x = \pi$.

3. 13M.1.sl.TZ1.3

[7 marks]

Consider $f(x) = x^2 \sin x$.

(a) Find $f'(x)$.

[4]

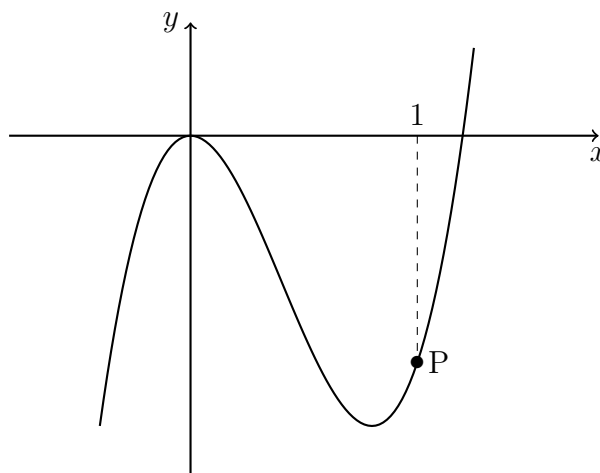
(b) Find the gradient of the curve of f at $x = \frac{\pi}{2}$.

[3]

4. 12N.1.sl.TZ0.4

[6 marks]

Part of the graph of $f(x) = ax^3 - 6x^2$ is shown below.



The point P lies on the graph of f . At P , $x = 1$.

(a) Find $f'(x)$.

[2]

(b) The graph of f has a gradient of 3 at the point P . Find the value of a .

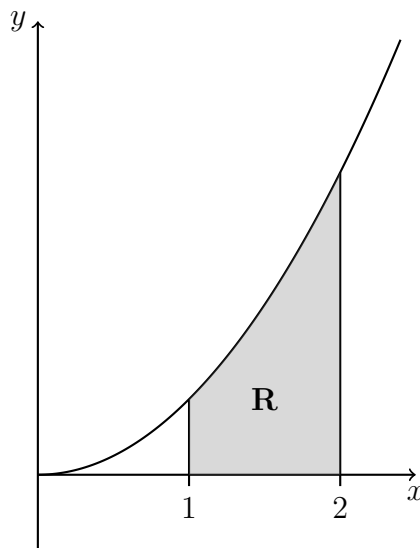
[4]

Name:

5. Let $f(x) = x^2$. [6 marks]

(a) Find $\int_1^2 (f(x))^2 dx$ [4]

(b) The following diagram shows part of the graph of f .



The shaded region R is enclosed by the graph of f , the x -axis, and the lines $x = 1$ and $x = 2$.

Find the volume of the solid formed when R is revolved 360° about the x -axis. [2]

6. 13N.1.sl.TZ0.4 [6 marks]

Consider a function $f(x)$ such that $\int_2^5 f(x) dx = 10$.

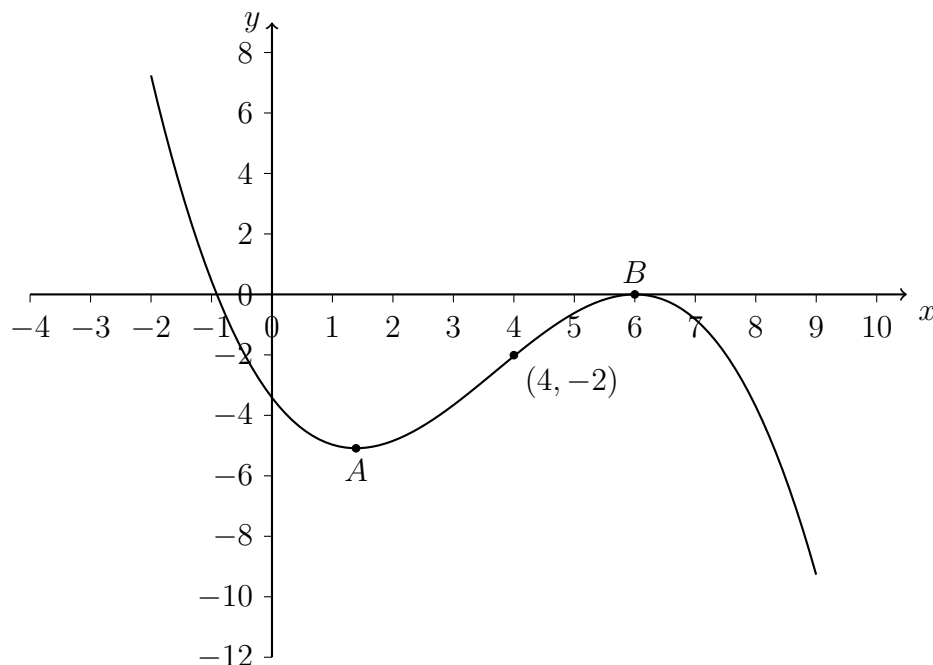
(a) Find $\int_2^5 3f(x) dx$. [2]

(b) Find $\int_2^5 (f(x) + 12) dx$. [4]

7. 17M.1.sl.TZ1.6

[6 marks]

The following diagram shows the graph of f' , the derivative of f .



The graph of f' has a local minimum at A , a local maximum at B and passes through $(4, 2)$. The point $P(4, 3)$ lies on the graph of the function, f .

- (a) Write down the gradient of the curve of f at P . [1]
- (b) Find the equation of the normal to the curve of f at P . [3]
- (c) Determine the concavity of the graph of f when $4 < x < 5$ **and** justify your answer. [2]

8. 16M.1.sl.TZ1.10

[15 marks]

Let $f(x) = \sqrt{4x + 5}$, for $x \geq -1.25$.

- (a) Find $f'(1)$. [4]
- (b) Consider another function g . Let R be a point on the graph of g . The x -coordinate of R is 1. The equation of the tangent to the graph at R is $y = 3x + 6$.
Write down $g'(1)$. [2]
- (c) Find $g(1)$. [2]
- (d) Let $h(x) = f(x) \times g(x)$. Find the equation of the tangent to the graph of h at the point where $x = 1$. [7]