$4x + 2$

$f'(x) = 4$

$4x + C$

$\uparrow$

$\int 4\,dx$

indefinite integral

$2x^2 + 6$

$f'(x) = 4x$

$2x^2 + C$

$\uparrow$

$\int 4x\,dx$

Why do we add "+ C" on the end of indefinite integrals?

Today's learning objective:

By the end of class, I will be able to calculate the value of "C" with the integral by utilizing additional information in problems.

Today's language objective:

Constant 7

Integral

Let $f'(x) = 12x^2 - 2$.

Given that $f(-1) = 1$, find $f(x)$.

(Tot

$f(x) = 4x^3 - 2x + 3$

$\int (12x^2 - 2)\,dx$

↓

$\frac{12x^{2+1}}{3} - \frac{2x^1}{1} + C$

$4x^3 - 2x + C = f(x)$

$4(-1)^3 - 2(-1) + C = 1$

$4(-1) + 2 + C = 1$

$-4 + 2 + C = 1$

$C = 3$

The curve $y = f(x)$ passes through the point $(2, 6)$.

Given that $\frac{dy}{dx} = 3x^2 - 5$, find y in terms of x.

$$\int (3x^2 - 5)\,dx$$

$$\downarrow$$

$$x^3 - 5x + C$$

$$6 = (2)^3 - 5(2) + C$$

$$6 = 8 - 10 + C$$

$$C = 8$$

$$y = x^3 - 5x + 8$$

It is given that $\frac{dy}{dx} = x^3 + 2x - 1$ and that $y = 13$ when $x = 2$.

Find y in terms of x.

Working:

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

$$\downarrow$$

$$\frac{x^4}{4} + x^2 - x + C$$

$$13 = \frac{(2)^4}{4} + (2)^2 - (2) + C$$

$$13 = 6 + C$$

$$7 = C$$

$$y = \frac{x^4}{4} + x^2 - x + 7$$

Answer: ....

(To

e derivative of the function f is given by $f'(x) = \frac{1}{1+x} - 0.5 \sin x$, for $x \neq -1$.

e graph of f passes through the point $(0, 2)$. Find an expression for $f(x)$.

$y = x$

Working:

$\ln = \log_e$

$\log_e 1 = ?$

$e^{?} = 1$

$f(x) = \ln(1+x) + 0.5\cos x + C$

$2 = \ln(1+0) + 0.5\cos 0 + C$

$2 = \underbrace{\ln 1}_{0} + 0.5(1) + C$

Answer:

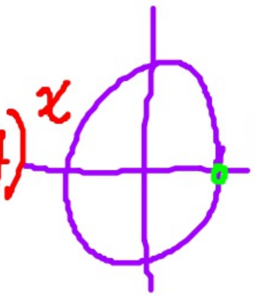
$f(x) = \ln(1+x) + 0.5\cos x + 1.5$

(Total 6 marks)

non-calc

$\log_{1.07} 2000 = x$

$\frac{1{,}000{,}000}{500} = \frac{500(1.07)^x}{500}$



$2000 = 1.07^x$

Let $f'(x) = 1 - x^2$. Given that $f(3) = 0$, find $f(x)$.

Working:

$$f(x) = x - \frac{x^3}{3} + C$$

$$f(3) = (3) - \frac{(3)^3}{3} + C = 0$$

$$C = 6$$

$$f(x) = x - \frac{x^3}{3} + 6$$

Answer:

....

(Total 4 m

If $f'(x) = \cos x$, and $f\left(\frac{\pi}{2}\right) = -2$, find $f(x)$.

Working:

Answer:

....

(Tota

83.) A curve with equation $y = f(x)$ passes through the point $(1, 1)$. Its gradient function is $f'(x) = -2x + 3$.

Find the equation of the curve.

Working:

Answer:

....

(Total

The function f is such that $f''(x) = 2x - 2$.

When the graph of f is drawn, it has a minimum point at (3, –7).

(a) Show that $f'(x) = x^2 - 2x - 3$ and hence find $f(x)$.

(b) Find $f(0)$, $f(-1)$ and $f'(-1)$.

(c) Hence sketch the graph of f, labelling it with the information obtained in part (b).

(**Note:** It is **not** necessary to find the coordinates of the points where the graph cuts the x-axis.)

(Total

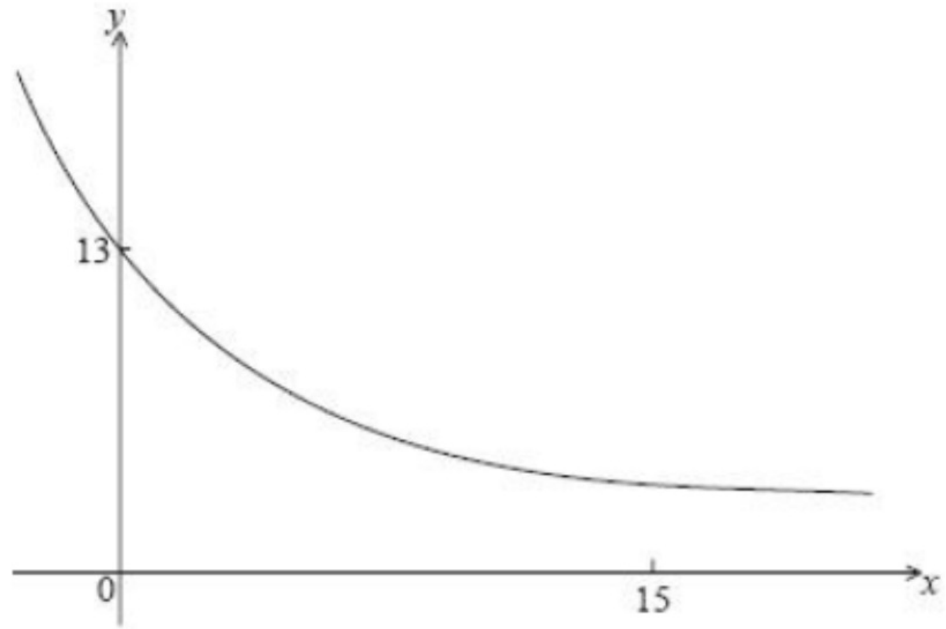
(i) Find $\frac{dy}{dx}$ in terms of k, where $y = e^{-kx}$.

The point P(1, 0.8) lies on the graph of the function $y = e^{-kx}$.

(ii) Find the value of k in this case.

(iii) Find the gradient of the tangent to the curve at P.

Let $f(x) = Ae^{kx} + 3$. Part of the graph of f is shown below.



The y-intercept is at (0, 13).

(a) Show that $A = 10$.

(2)

(b) Given that $f(15) = 3.49$ (correct to 3 significant figures), find the value of k.

(3)

(c) (i) Using your value of k, find $f'(x)$.

(ii) Hence, explain why f is a decreasing function.

(iii) Write down the equation of the horizontal asymptote of the graph f.

(5)

(a) Find $\int \frac{1}{2x+3}\,dx$.

(2)

(b) Given that $\int_0^3 \frac{1}{2x+3}\,dx = \ln \sqrt{P}$, find the value of P.

(4)

(Total 6 marks)

Let $f(x) = \sqrt{x}$. Line L is the normal to the graph of f at the point (4, 2).

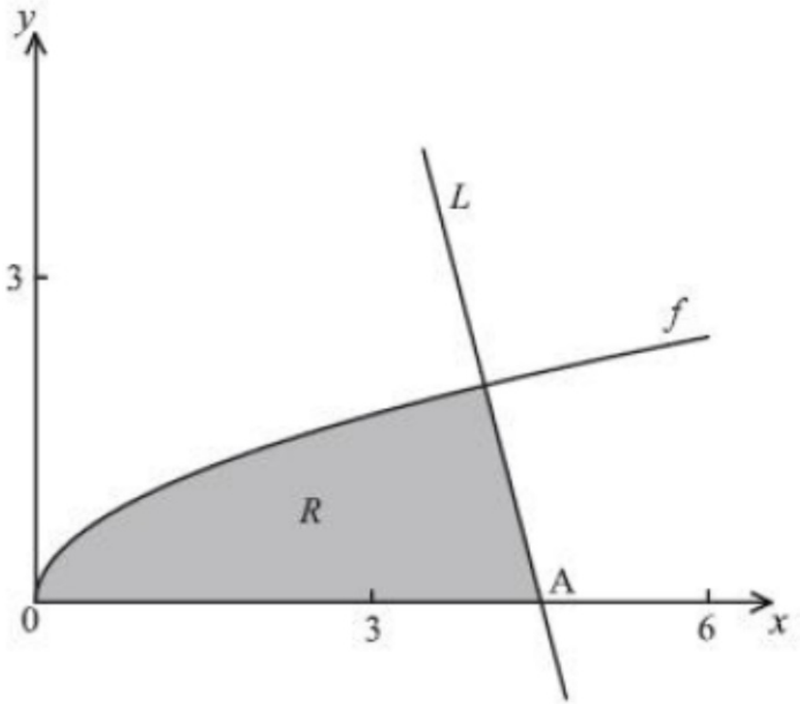
(a) Show that the equation of L is $y = -4x + 18$.

(4)

(b) Point A is the x-intercept of L. Find the x-coordinate of A.

(2)

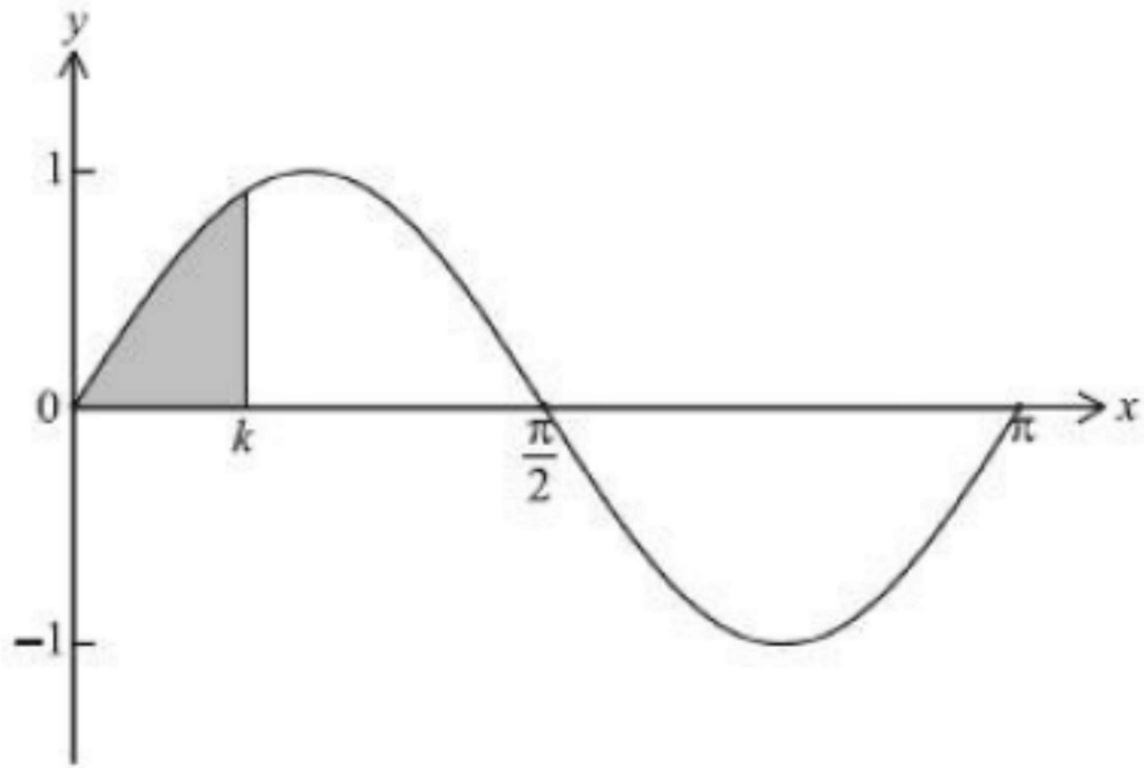
In the diagram below, the shaded region R is bounded by the x-axis, the graph of f and the line L.



(c) Find an expression for the area of R.

Given $\int_3^k \frac{1}{x-2}\,\mathrm{d}x = \ln 7$, find the value of k.

The graph of $y = \sin 2x$ from $0 \leq x \leq \pi$ is shown below.



The area of the shaded region is 0.85. Find the value of k.

Let f be a function such that $\int_0^3 f(x)\,\mathrm{d}x = 8$.

(a) Deduce the value of

(i) $\int_0^3 2f(x)\,\mathrm{d}x$;

(ii) $\int_0^3 (f(x)+2)\,\mathrm{d}x$.

(b) If $\int_c^d f(x-2)\,\mathrm{d}x = 8$, write down the value of c and of d.

Given that $\int_1^3 g(x)\mathrm{d}x = 10$, deduce the value of

(a) $\int_1^3 \frac{1}{2} g(x)\mathrm{d}x$;

(b) $\int_1^3 (g(x)+4)\mathrm{d}x$.