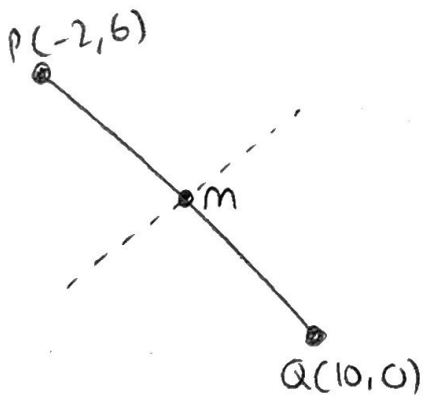


1.

$$y = x^{5/3} - 10x^{-4}$$

$$\frac{dy}{dx} = \frac{5}{3}x^{2/3} + 40x^{-5}$$

2.



$$M(4, 3)$$

$$\begin{aligned} m_{PQ} &= \frac{0-6}{10+2} \\ &= \frac{-6}{12} \\ &= -\frac{1}{2} \end{aligned}$$

$$m_{perp} = 2$$

$$y-3 = 2(x-4)$$

$$y-3 = 2x-8$$

$$\longrightarrow y = 2x-5$$



3.

$$\log_5 x - \log_5 3 = 2 \log_5 5$$

$$\log_5 \left(\frac{x}{3} \right) = \log_5 5^2$$

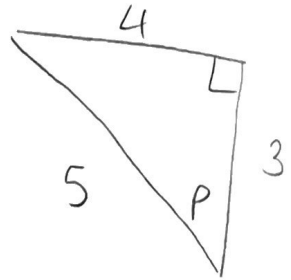
$$\frac{x}{3} = 25$$

$$x = 75$$

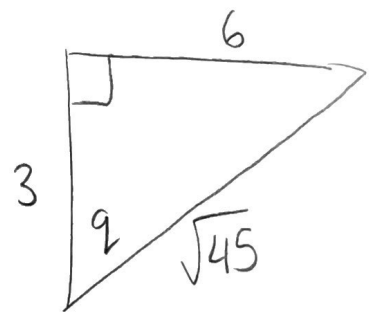


QUESTION
NUMBER4.(a)
(i)

$$\cos p = \frac{3}{5}$$

4.(a)
(ii)

$$\cos q = \frac{3}{\sqrt{45}}$$



4.(b)

$$\begin{aligned} & \cos(p+q) \\ &= \cos p \cos q - \sin p \sin q \\ &= \frac{3}{5} \cdot \frac{3}{\sqrt{45}} - \frac{4}{5} \cdot \frac{6}{\sqrt{45}} \\ &= \frac{9}{5\sqrt{45}} - \frac{24}{5\sqrt{45}} \\ &= \frac{-15}{5\sqrt{45}} = -\frac{3}{\sqrt{45}} = -\frac{3}{3\sqrt{5}} = -\frac{1}{\sqrt{5}} \end{aligned}$$



* X 8 4 7 7 6 0 1 0 4 *

QUESTION NUMBER

5.

$$(3p-2)^2 - 4(2)(p) = 0$$

$$9p^2 - 12p + 4 - 8p = 0$$

$$9p^2 - 20p + 4 = 0$$

$$(9p-2)(p-2) = 0$$

$$p = \frac{2}{9} \quad p = 2$$

(36)

$$-18 - 2$$

$$9p^2 - 18p - 2p + 4$$

$$= 9p(p-2) - 2(p-2)$$

$$= (9p-2)(p-2)$$

6.

$$\int 2x^5 - 6x^{\frac{1}{2}} dx$$

$$= \frac{2x^6}{6} - \frac{6x^{\frac{3}{2}}}{\frac{3}{2}} + C$$

$$= \frac{x^6}{3} - 4x^{\frac{3}{2}} + C$$



* X 8 4 7 7 6 0 1 0 5 *

7.(a)

$$\begin{aligned} & \log_2 5 + \log_2 \frac{1}{40} \\ &= \log_2 \left(\frac{5}{40} \right) \\ &= \log_2 \frac{1}{8} \\ &= -3. \end{aligned}$$

$$\begin{aligned} \frac{1}{8} &= 8^{-1} = (2^3)^{-1} \\ &= 2^{-3} \end{aligned}$$

7.(b)

$$\log_8 a < 0$$

$$0 < a < 1$$

$$\log_8 8 = 1$$

$$\log_8 1 = 0$$

$\log_8 0$ is
undefined



8.

$$f(x) = x^3 + 3x^2 - 9x + 5$$

$$f'(x) = 3x^2 + 6x - 9$$

$$3x^2 + 6x - 9 = 0$$

$$x^2 + 2x - 3 = 0$$

$$(x+3)(x-1) = 0$$

$$x = -3 \quad x = 1$$

$$y = 32 \quad y = 0$$

$$(-3, 32) \quad (1, 0)$$

	$\xrightarrow{-4}$	-3	$\xrightarrow{-2}$
$f'(x)$	+	0	-
shape	\nearrow	\rightarrow	\searrow

Max @ $(-3, 32)$

	$\xrightarrow{0}$	1	$\xrightarrow{2}$
$f'(x)$	-	0	+
shape	\searrow	\rightarrow	\nearrow

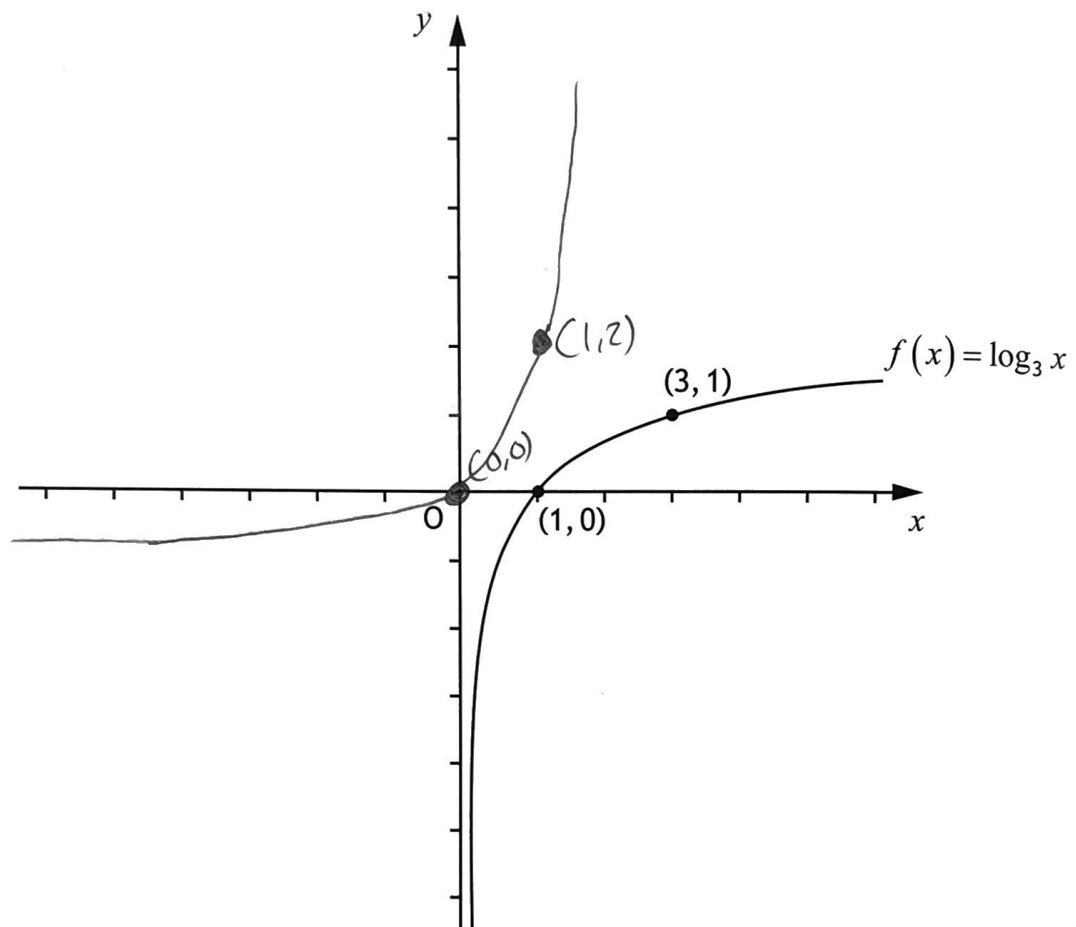
Min @ $(1, 0)$



* X 8 4 7 7 6 0 1 0 7 *

9.

An additional diagram, if required, can be found on *page 13*.



* X 8 4 7 7 6 0 1 0 8 *

10.(a)

$$\begin{array}{r|rrrrr}
 -5 & x^4 & x^3 & x^2 & x & r \\
 & 1 & 3 & -7 & 9 & -30 \\
 & \downarrow & & & & \\
 & & -5 & 10 & -15 & 30 \\
 \hline
 & 1 & -2 & 3 & -6 & \boxed{0}
 \end{array}$$

Since $r=0$,
 $(x+5)$ is
 a factor

10.(b)

$$(x+5)(x^3 - 2x^2 + 3x - 6) = 0$$

$$\begin{array}{r|rrrr}
 2 & x^3 & x^2 & x & r \\
 & 1 & -2 & 3 & -6 \\
 & \downarrow & & & \\
 & & 2 & 0 & 6 \\
 \hline
 & 1 & 0 & 3 & \boxed{0}
 \end{array}$$

Since $r=0$, $(x+2)$ is a factor

$$(x+5)(x-2)(x^2+3) = 0$$

$$x = -5 \quad x = 2 \quad x^2 + 3 = 0$$

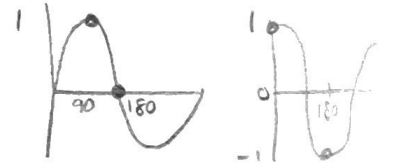
has no real
 solutions

$$(b^2 - 4ac = -12)$$

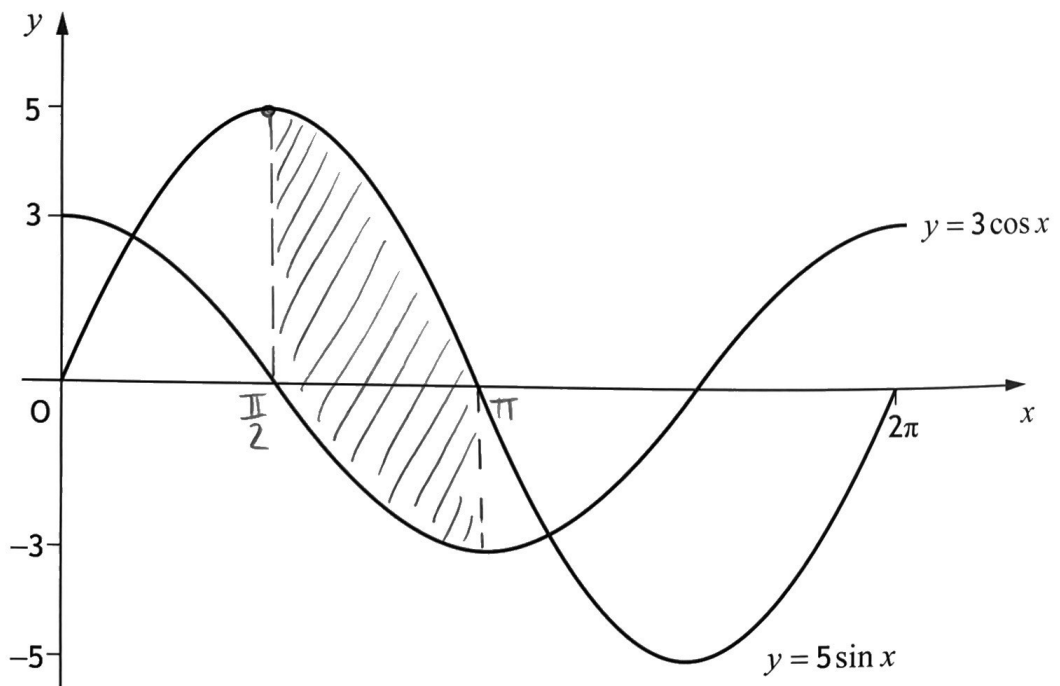


11.(a)

$$\begin{aligned}
 & \int_{\frac{\pi}{2}}^{\pi} 5 \sin x - 3 \cos x \, dx \\
 &= \left[-5 \cos x - 3 \sin x \right]_{\frac{\pi}{2}}^{\pi} \\
 &= \left[-5 \cos \pi - 3 \sin \pi \right] - \left[-5 \cos \frac{\pi}{2} - 3 \sin \frac{\pi}{2} \right] \\
 &= \left[-(-5) - 0 \right] - \left[0 - 3 \right] \\
 &= 5 - (-3) \\
 &= 8
 \end{aligned}$$



11.(b) An additional diagram, if required, can be found on page 14.



* X 8 4 7 7 6 0 1 1 0 *

12.

$$\begin{aligned} & -2x^2 - 12x + 7 \\ &= -2[x^2 + 6x] + 7 \\ &= -2[(x+3)^2 - 9] + 7 \\ &= -2(x+3)^2 + 18 + 7 \\ &= -2(x+3)^2 + 25. \end{aligned}$$



QUESTION
NUMBER13.(a)
(i)

$$g\left(\frac{\pi}{6}\right) = \frac{2\pi}{6}$$

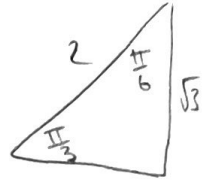
$$= \frac{\pi}{3}$$

$$f\left(g\left(\frac{\pi}{6}\right)\right)$$

$$= f\left(\frac{\pi}{3}\right)$$

$$= 2\sin\frac{\pi}{3}$$

$$= \sqrt{3}$$

DO NOT
WRITE IN
THIS
MARGIN13.(a)
(ii)

$$f(g(x))$$

$$= f(2x)$$

$$= 2\sin 2x$$

13.(b)
(i)

$$2\sin p = \frac{1}{3}$$

$$\sin p = \frac{1}{6}$$

13.(b)
(ii)

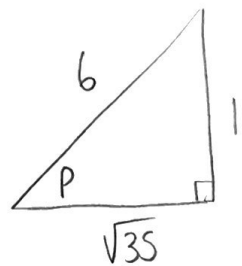
$$f(g(p)) = 2\sin 2p$$

$$= 2(2\sin p \cos p)$$

$$= 4 \times \frac{1}{6} \times \frac{\sqrt{35}}{6}$$

$$= \frac{4\sqrt{35}}{36}$$

$$= \frac{\sqrt{35}}{9}$$



* X 8 4 7 7 6 0 1 1 2 *