qu.	Use	Key	Code	ITEM
145	Web2	C	A 1	921

- $x^2+10x-24=0$

  $(x+12)(x-2)=0$
- $x=-12,\ x=2$

qu.	Use	Key	Code	ITEM
146	Web2	C	A 2	996

- $\log_6 2x=1 \Rightarrow x=3$
- $\log_6 2x=0 \Rightarrow 2x=1$
- (•) $x=\frac{1}{2}$

qu.	Use	Key	Code	ITEM
147	Web2	B	A 3	919

- $(b,3) \rightarrow (b,-3)$
- *so* B

qu.	Use	Key	Code	ITEM
148	Web2	B	A 4	55

- $f(2x)$
- $(2x)^2+1$
- (•) $4x^2+1$

qu.	Use	Key	Code	ITEM
149	Web2	B	A 5	925

- $2p=-8 \Rightarrow p=-4$
- $p^2+q=7 \Rightarrow q=-9$

qu.	Use	Key	Code	ITEM
150	Web2	D	A 6	1235

- $\sin\left(x-\frac{\pi}{6}\right)=1 \Rightarrow x=\frac{2\pi}{3}$ *so* (1)√
- $y_{\max}=3\times1+5=8$ *so* (2)√

qu.	Use	Key	Code	ITEM
151	Web2	D	A 7	9

- $(0,0) \Rightarrow$ *not* C
- $(1,-2) \Rightarrow C$ *or* D
- (•) D

qu.	Use	Key	Code	ITEM
152	Web2	B	A 10	2001

$u_2=0.4\times50+5=25$
- $u_3=0.4\times25+5=15$

$u_4=0.4\times15+5=11$
- $u_5=0.4\times11+5=9.4$

qu.	Use	Key	Code	ITEM
153	Web2	D	A 11	1074

- $u_{k+1}=3u_k-2=13$
- $u_{k+2}=3u_{k+1}-2=37$

qu.	Use	Key	Code	ITEM
154	Web2	C	A 12	1109

- $-1<p-1<1$
- $0<p<2$

qu.	Use	Key	Code	ITEM
155	Web2	A	A 13	929

- $L=-0.7L+21$
- $L=\frac{21}{1.7}$
- (•) $L=\frac{210}{17}$

qu.	Use	Key	Code	ITEM
156	Web2	C	A 15	1001

- $y=k(x+2)(x-4)$
- $-1=k(6+2)(6-4)$
- (•) $k=-\frac{1}{16}$

qu.	Use	Key	Code	ITEM
157	Web2	D	A 16	930

- $(x+2)(2x-3)>0$
- $x=0$ *is false*
- (•) $x<-2,\ x>\frac{3}{2}$

qu.	Use	Key	Code	ITEM
158	Web2	A	A 17	1163

- $\begin{pmatrix}0\\-3\end{pmatrix}$ *on* $f \Rightarrow$ cuts x-axis twice
- $b^2-4ac>0$

qu.	Use	Key	Code	ITEM
159	Web2	D	A 18	1003

- $b^2-4ac=0$
- $16-(-24k)=0$
- (•) $k=-\frac{2}{3}$

qu.	Use	Key	Code	ITEM
160	Web2	A	A 19	1076

- $y=k(x+3)(x-1)(x-2)$
- $12=6k$
- (•) $k=2$

qu.	Use	Key	Code	ITEM
161	Web2	B	A 21	91

- $(-5)^3+4\times(-5)^2-5k-10=0$
- $-125+100-10=5k$
- (•) $k=-7$

qu.	Use	Key	Code	ITEM
162	Web2	C	A 23	1902

- $x=-\frac{2}{3}y-\frac{7}{3}$
- $y=3\left(-\frac{2}{3}y-\frac{7}{3}\right)^2+4\left(-\frac{2}{3}y-\frac{7}{3}\right)-7$

qu.	Use	Key	Code	ITEM
163	Web2	C	A 28	24

- $\log_9 9^{\frac{3}{2}}$
- $\frac{3}{2}\log_9 9$

qu.	Use	Key	Code	ITEM
164	Web2	D	A 31	339

- $64=y^{\frac{2}{3}}$
- $8=y^{\frac{1}{3}}$
- (•) $y=512$

qu.	Use	Key	Code	ITEM
165	Web2	A	A 32	1251

- $\log_4 8q=1$
- $8q=4$
- (•) $q=\frac{1}{2}$

qu.	Use	Key	Code	ITEM
166	Web2	A	A 33	2034

$y=100x^3$
- $\log_{10} y=\log_{10}(100x^3)$
- $\log_{10} y=\log_{10}100+\log_{10}x^3$
- (•) $\log_{10} y=2+3\log_{10}x$

qu.	Use	Key	Code	ITEM
167	Web2	C	C 1	307

- $f'(x)=12x^2$
- $f'(2)=12\times4$
- (•) $f'(2)=48$

qu.	Use	Key	Code	ITEM
168	Web2	A	C 2	1008

- •• $\frac{dy}{dx}=\frac{1}{4}x^{-\frac{3}{4}}+\frac{1}{2}x^{-\frac{3}{2}}$

qu.	Use	Key	Code	ITEM
169	Web2	D	C 3	30

- $f(x)=x^{-2}$
- $f'(x)=-2x^{-3}$
- (•) $f'(x)=-\frac{2}{x^3}$

qu.	Use	Key	Code	ITEM
170	Web2	A	C 4	968

- $\frac{dy}{dx}=3x^2+4x$
- $\frac{dy}{dx}_{x=1}=3\times1+4\times1=7$

qu.	Use	Key	Code	ITEM
171	Web2	A	C 6	1011

- $\frac{dv}{dt}=2t+2$
- $t=3 \Rightarrow \frac{dv}{dt}=8$

qu.	Use	Key	Code	ITEM
172	Web2	B	C 7	366

- $f'(x)=-4x^{-3}$
- $-\frac{4}{x^3}>0$
- x^3 *is neg.*, x *is neg.*

qu.	Use	Key	Code	ITEM
173	Web2	D	C 8	330

- *stationary pts at* $f'(x)=0$
- $x(x+2)=0$
- (•) $x=0,\ x=-2$

174	Web2	B	C 12	942

- • $f(x)=2x^3-x^{-1}+c$

175	Web2	C	C 13	248

- $y=\left[\frac{3}{7}x^{\frac{7}{3}}\right]_{-1}^{1}$
- $y=\left(\frac{3}{7}\times 1^{\frac{7}{3}}\right)-\left(\frac{3}{7}\times(-1)^{\frac{7}{3}}\right)$
- $y=\frac{3}{7}-\left(-\frac{3}{7}\right)=\frac{6}{7}$

176	Web2	A	C 14	115

- $f'(x)=x^{-4}$
- $f(x)=-\frac{1}{3}x^{-3}$
- (•) $f(x)=-\frac{1}{3x^3}+c$

177	Web2	D	C 15	2039

- $I=\left[12x+\frac{1}{4}x^4\right]_0^2$
  $=(24+4)-0$
- $=28$

178	Web2	A	C 17	208

- $\sin x=\cos x$
- $x=\frac{\pi}{4}$
- $\int_0^{\frac{\pi}{4}}\sin x\ dx\ +\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}\cos x\ dx$

179	Web2	A	C 18	1071

- know to integrate
- $y=\frac{1}{3}x^3-2x^2+c$

180	Web2	A	C 20	85

- $\frac{dy}{dx}=-\sin x$
- gradient $=-\sin\frac{\pi}{2}$
- (•) gradient $=-1$

181	Web2	C	C 21	1094

- $f'(x)=3(x^4+2x)^2\times.....$
- $f'(x)=.....\times(4x^3+2)$
- (•) $f'(x)=3(4x^3+2)(x^4+2x)^2$

qu.	Use	Key	Code	ITEM
182	Web2	C	C 22	320

- $y=\frac{1}{4}(2x+1)^4\times.....$
- $y=.....\times\frac{1}{2}$
- (•) $y=\frac{1}{8}(2x+1)^4+c$

183	Web2	B	C 23	98

- $I=-\cos 3x\times.....$
- $I=.....\times\frac{1}{3}$
- (•) $I=-\frac{1}{3}\cos 3x+c$

184	Web2	C	G 1	1045

- $PQ=\sqrt{(-2-3)^2+(3-5)^2+(1-2)^2}$
- $PQ=\sqrt{30}$

185	Web2	B	G 2	86

- $m_{AB}=\frac{8-0}{0-(-4)}=2$
- $m_{AC}=\frac{8-(-4)}{0-p}=-\frac{12}{p}$
- $-2p=12.....p=-6$

186	Web2	A	G 3	129

- $m\ =\frac{-2-4}{1-(-3)}=-\frac{3}{2}$
- $y-4=-\frac{3}{2}(x+3)$
  $2y-8=-3x-9$
- $3x+2y+1=0$

187	Web2	D	G 5	976

- $y=-\frac{3}{5}x+\frac{8}{5}\ AND\ \ m=-\frac{3}{5}$
- $m_{\perp}=\frac{5}{3}$

188	Web2	A	G 7	1048

- $m_{\perp\ to\ ST}=\frac{1}{2}$
- $y-8=\frac{1}{2}(x-6)$
- (•) $y=\frac{1}{2}x+5$

189	Web2	D	G 9	144

- $x^2+y^2-4x-3y+\frac{1}{3}=0$
- $C=(2,1\frac{1}{2})$

qu.	Use	Key	Code	ITEM
190	Web2	C	G 10	970

- $centre(P)=(2,-3)$
- $radius(Q)=4$
- (•) $(x-2)^2+(y+3)^2=16$

191	Web2	C	G 11	1061

- $m_{OC}=\frac{4}{3}$
- $m_{tgt}=-\frac{3}{4}$
- (•) $y=-\frac{3}{4}x$

192	Web2	A	G 12	2083

- $(2y+5)^2+y^2$
- $-6(2y+5)-3y-5=0$
- $5y^2+5y-10=0$

193	Web2	D	G 16	52

- $\overrightarrow{PQ}=\begin{pmatrix}-6\\-4\\4\end{pmatrix}$
- $\left|\overrightarrow{PQ}\right|=\sqrt{36+16+16}=\sqrt{68}$

194	Web2	A	G 17	1185

- $\overrightarrow{PQ}=\begin{pmatrix}3\\1\\1\end{pmatrix}$ • $\overrightarrow{RS}=\begin{pmatrix}9\\3\\3\end{pmatrix}$
- (•) $R=(1,4,2)\ so\ S=(10,7,5)$

195	Web2	C	G 18	165

- $\left(\frac{6}{7}\right)^2+\left(-\frac{3}{7}\right)^2+z^2=1$
- $z^2=\frac{4}{49}$ (•) $z=\pm\frac{2}{7}$

196	Web2	D	G 19	956

- $\frac{2}{5}=\frac{-4}{p}$
- $2p=-20,\ p=-10$

197	Web2	D	G 20	35

- $\boldsymbol{x}=\frac{1}{2}(2\boldsymbol{v}-3\boldsymbol{u})$
- $\boldsymbol{x}=\frac{1}{2}\left[\begin{pmatrix}4\\-8\\0\end{pmatrix}-\begin{pmatrix}3\\0\\3\end{pmatrix}\right]$ (•) $x=\begin{pmatrix}\frac{1}{2}\\-4\\-\frac{3}{2}\end{pmatrix}$

qu.	Use	Key	Code	ITEM
198	Web2	B	G 21	1033

- $\overrightarrow{NP} = \frac{1}{4}\overrightarrow{NL}$
- $\overrightarrow{NL} = -\boldsymbol{u} + \boldsymbol{v}$

(•) $\overrightarrow{NP} = \frac{1}{4}(-\boldsymbol{u} + \boldsymbol{v})$

199	Web2	D	G 22	1137

200	Web2	A	G 24	1138

- $\overrightarrow{PX} = \begin{pmatrix}-15\\-25\\-20\end{pmatrix} = 5\begin{pmatrix}-3\\-5\\-4\end{pmatrix}$
- $\overrightarrow{XQ} = \begin{pmatrix}-6\\-10\\-8\end{pmatrix} = 2\begin{pmatrix}-3\\-5\\-4\end{pmatrix}$ (•) *ratio* $= 5:2$

201	Web2	B	G 25	1035

- $\overrightarrow{KL} = \begin{pmatrix}10\\0\\-10\end{pmatrix}$
- $\overrightarrow{KP} = \begin{pmatrix}4\\0\\-4\end{pmatrix}$

(•) K $= (-1,0,4)$ *so* P $= (3,0,0)$

202	Web2	C	G 26	1036

- $\boldsymbol{r}.\boldsymbol{s} = |\boldsymbol{r}||\boldsymbol{s}|\cos 45°$
- $\boldsymbol{r}.\boldsymbol{s} = 1 \times \sqrt{2} \times \frac{1}{\sqrt{2}}$

(•) $\boldsymbol{r}.\boldsymbol{s} = 1$

203	Web2	A	G 27	1059

- $\begin{pmatrix}g\\3\\2\end{pmatrix}.\begin{pmatrix}5\\-4\\-g\end{pmatrix} = 0$
- $5g - 12 - 2g = 0$ (•) $g = 4$

204	Web2	A	G 28	983

- $\cos t° = \frac{\sqrt{3}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{3}}{2}$
- $t = 30$

205	Web2	B	G 29	1039

- $\boldsymbol{i}.\boldsymbol{i} + 2\boldsymbol{i}.\boldsymbol{j} - \boldsymbol{i}.\boldsymbol{k}$
- $|\boldsymbol{i}|^2 + 0 + 0$

(•) 1

206	Web2	B	T 1	68

- $2t - \frac{\pi}{4} = \frac{\pi}{2}$
- $2t = \frac{3\pi}{4}$ (•) $t = \frac{3\pi}{8}$

qu.	Use	Key	Code	ITEM
207	Web2	A	T 3	1143

- $-\frac{1}{2}$.....
- .....$-\frac{1}{2} = -1$

208	Web2	B	T 4	974

- max/ min $= \pm 3$ *so* A *or* B
- $x = \pi$, $y = 3\sin\frac{\pi}{2} = 3$ *so* B

209	Web2	B	T 5	7

- $\min\left(1 - \cos\left(t - \frac{\pi}{3}\right)\right)$
  when $\cos\left(t - \frac{\pi}{3}\right)$ *is* max
- $\cos\left(t - \frac{\pi}{3}\right) = 1$ (•) $t = \frac{\pi}{3}$

210	Web2	A	T 7	1150

- $\sin x = \frac{1}{\sqrt{2}}$ *or* $-\frac{1}{\sqrt{2}}$
- $x = \frac{\pi}{4}$ *or no sol. so* A

211	Web2	B	T 8	34

- $\cos 45\cos 30 + \sin 45\sin 30$
- $\frac{1}{\sqrt{2}}.\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}.\frac{1}{2}$
  $\frac{\sqrt{3}+1}{2\sqrt{2}}$

212	Web2	B	T 9	216

- $\sin 2x = 2\sin x\cos x$
- $\cos x = \sqrt{1-k^2}$

(•) $\sin 2x = 2k\sqrt{1-k^2}$

213	Web2	D	T 12	1196

- $k^2 = 3 + 1$, $k = 2$
- $\tan a° = \frac{1}{\sqrt{3}}$, $a = 30$

214	Web2	B	T 13	42

- $k\sin a = 2$, $k\cos a = -3$
- $\tan a = -\frac{2}{3}$

145

$$y = \frac{1}{x^2 + 10x - 24}.$$

For what values of x is y undefined?

A $x = -6$ *and* $x = 4$

B $x = -2$ *and* $x = 12$

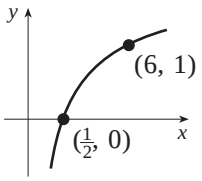
C $x = 2$ *and* $x = -12$

D $x = 6$ *and* $x = -4$

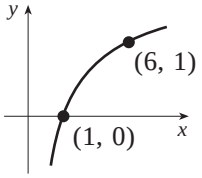
146

Which of the following sketches shows part of the graph of $y = \log_6 2x$?

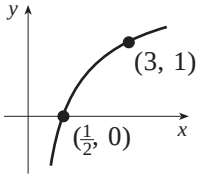
A



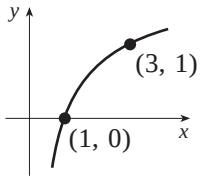
B



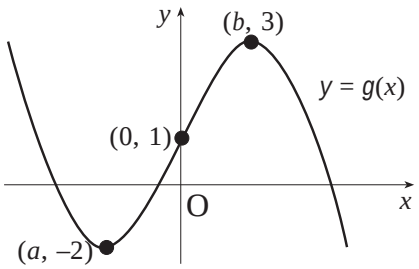
C



D

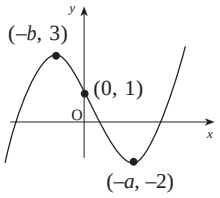


147 The diagram shows the graph of $y = g(x)$.

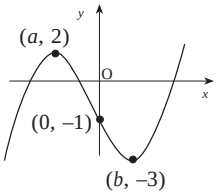


Which diagram below shows the graph of $y = -g(x)$?

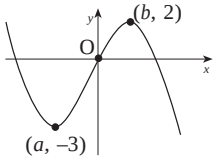
A



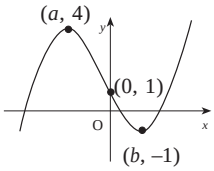
B



C



D



148 f and g are functions defined by $f(x) = x^2 + 1$ and $g(x) = 2x$, where x is a real number.

Find an expression for $f\big(g\big(x\big)\big)$.

A $f\big(g\big(x\big)\big) = 2x^2 + 2$

B $f\big(g\big(x\big)\big) = 4x^2 + 1$

C $f\big(g\big(x\big)\big) = 2x^3 + 1$

D $f\big(g\big(x\big)\big) = 2x^3 + 2x$

149

When $x^2 - 8x + 7$ is written in the form $(x + p)^2 + q$, what is the value of q?

A -57
B -9
C 7
D 23

150

Here are two statements about the graph of $y = 3\sin\left(x - \frac{\pi}{6}\right) + 5$ for $0 \leq x \leq 2\pi$:

(1) the maximum occurs when $x = \frac{2\pi}{3}$

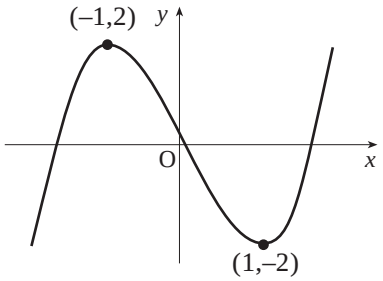
(2) the maximum value of the function is 8.

Which of the following is true?

A only statement (1) is correct
B only statement (2) is correct
C neither statement is correct
D both statements are correct

151

The diagram shows the sketch of a cubic function f with turning points at $(-1, 2)$ and $(1, -2)$.
Which of the following is most likely to be $f(x)$?



A $x^3 - x$
B $-x^3 + 3x$
C $-x^3 - 3x^2 - x + 3$
D $x^3 - 3x$

152

A sequence is defined by the recurrence relation $u_{n+1} = 0.4u_n + 5,\ u_1 = 50$.
What is the smallest value of n for which $u_n < 11$?

A $n = 3$
B $n = 5$
C $n = 7$
D $n = 9$

153

The terms of a sequence satisfy the recurrence relation $u_{n+1} = 3u_n - 2$.
If $u_k = 5$, what is the value of u_{k+2} ?

A $\frac{7}{3}$
B 7
C 13
D 37

154

A sequence is defined by the recurrence relation
$u_{n+1} = (p-1)u_n + 3$ with $u_0 = 12$.
For what values of p does this sequence have
a limit?

A $0 \leq p \leq 2$ only
B $-1 \leq p \leq 1$ only
C $0 < p < 2$ only
D $-1 < p < 1$ only

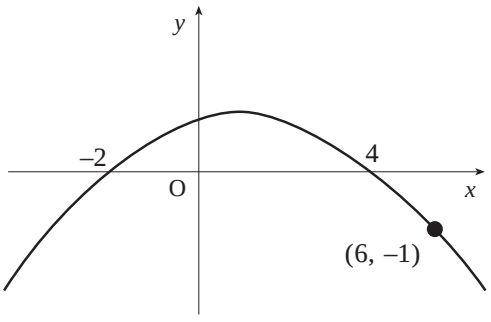
155

A sequence is defined by the recurrence relation $u_{n+1} = -0.7u_n + 21$ with $u_0 = 10$.
What is the limit of this sequence?

A $\frac{210}{17}$
B $\frac{210}{13}$
C 30
D 70

156

The diagram shows part of the graph of a quadratic function.
The equation of of the graph is of the form $y = k(x-l)(x-m)$.



What is the value of k ?

A -9
B -2
C $-\frac{1}{16}$
D $-\frac{1}{8}$

157 For what range of values of x is $2x^2 + x - 6 > 0$?

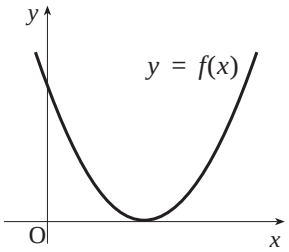
A $x < -\frac{3}{2}$ *or* $x > 2$

B $-\frac{3}{2} < x < 2$

C $-2 < x < \frac{3}{2}$

D $x < -2$ *or* $x > \frac{3}{2}$

158 The diagram shows part of the graph of a parabola $y = f(x)$ which touches the x-axis as shown.
The function g is given by $g(x) = f(x) - 3$.



Which of the following describes the value of the discriminant of g ?

A discriminant > 0

B discriminant $= 0$

C discriminant < 0

D discriminant = any real number

159 The roots of the equation $kx^2 + 4x - 6 = 0$ are equal.
What is the value of k?

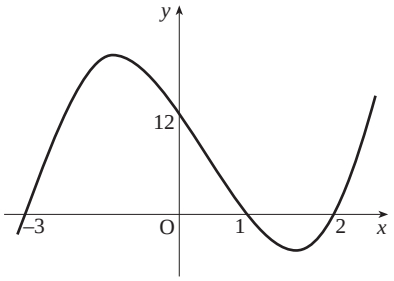
A -9

B $-\frac{1}{6}$

C $-\frac{1}{3}$

D $-\frac{2}{3}$

160 The diagram shows part of the graph of a cubic function f.



What is the equation of the graph?

A $y = 2(x-1)(x-2)(x+3)$
B $y = -2(x+1)(x+2)(x-3)$
C $y = 12(x-1)(x-2)(x+3)$
D $y = 12(x+1)(x+2)(x-3)$

161 If $x+5$ is a factor of the polynomial $x^3 + 4x^2 + kx - 10$ what is the value of k ?

A -3
B -7
C -35
D -43

162 The line with equation $3x + 2y + 7 = 0$ intersects the parabola with equation $y = 3x^2 + 4x - 7$ at two points, P and Q.
Which of the following equations can be solved to find the coordinates of P and Q ?

A $y = 3\big(2y+7\big)^2 + 4\big(2y+7\big) - 7$
B $y = 3\big(-2y-7\big)^2 + 4\big(-2y-7\big) - 7$
C $y = 3\big(-\frac{2}{3}y - \frac{7}{3}\big)^2 + 4\big(-\frac{2}{3}y - \frac{7}{3}\big) - 7$
D $y = 3\big(\frac{2}{3}y + \frac{7}{3}\big)^2 + 4\big(\frac{2}{3}y + \frac{7}{3}\big) - 7$

163 What is the exact value of $\log_9 27$?

A $\frac{1}{3}$
B $\frac{2}{3}$
C $\frac{3}{2}$
D 3

164

Given that $\log_y 64 = \frac{2}{3}$, find the value of y .

A 24
B 96
C 256
D 512

165

Given that $\log_4 8 + \log_4 q = 1$, what is the value of q ?

A $\frac{1}{2}$
B $\frac{1}{32}$
C $\frac{1}{8}$
D 2

166

A graph is drawn of $\log_{10} y$ against $\log_{10} x$ where $y = 100x^3$.
What is the equation of the graph ?

A $\log_{10} y = 3\log_{10} x + 2$
B $\log_{10} y = 100\log_{10} x$
C $\log_{10} y = 300(\log_{10} x)^2$
D $\log_{10} y = 300\log_{10} x$

167

Given that $f(x) = 4x^3 + 5$, find the value of $f'(2)$.

A 21
B 26
C 48
D 53

168

What is the derivative, with respect to x, of $x^{\frac{1}{4}} - x^{-\frac{1}{2}}$?

A $\frac{1}{4}x^{-\frac{3}{4}} + \frac{1}{2}x^{-\frac{3}{2}}$
B $\frac{1}{4}x^{-\frac{3}{4}} - \frac{1}{2}x^{-\frac{3}{2}}$
C $\frac{1}{4}x^{-\frac{1}{4}} + \frac{1}{2}x^{-\frac{3}{2}}$
D $\frac{1}{4}x^{\frac{1}{4}} + \frac{1}{2}x^{-\frac{1}{2}}$

169

If $f(x) = \frac{1}{x^2}$ and $x \neq 0$, find $f'(x)$.

A $\frac{1}{2x}$

B $\frac{2}{x}$

C $-\frac{1}{x^3}$

D $-\frac{2}{x^3}$

170

A curve has equation $y = x^3 + 2x^2 + 5$.
What is the gradient of the curve at the point where $x = 1$?

A 7

B 8

C 10

D 12

171

The speed, v m/s, at time t seconds is given by $v(t) = t^2 + 2t$.
What is the rate of change of speed when $t = 3$?

A $8\ m/s^2$

B $12\ m/s^2$

C $15\ m/s^2$

D $18\ m/s^2$

172

Find the values of x for which the graph of the function $f(x) = \frac{2}{x^2}, x \neq 0$, has a positive gradient.

A all possible values

B $x < 0$ only

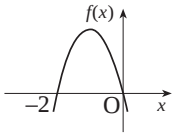
C $x > 0$ only

D $x^3 < 4$ only

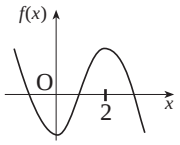
173

Which of the following graphs could be part of the graph of a function f such that $f'(x) = x(x+2)$?

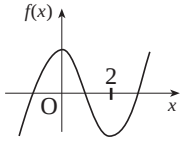
A



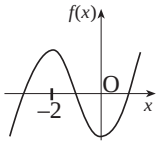
B



C



D



174

If $f(x) = \int \left(6x^2 + x^{-2}\right)\ dx$, then find $f(x)$.

A $18x^3 - x^{-1} + c$

B $2x^3 - x^{-1} + c$

C $12x - 2x^{-3} + c$

D $2x^3 - \frac{1}{3}x^{-3} + c$

175

Find $\int_{-1}^{1} \left(x^{\frac{4}{3}}\right)\ dx$.

A 0

B $\frac{3}{7}$

C $\frac{6}{7}$

D $\frac{10}{3}$

176

Find $\int\left(\frac{1}{x^4}\right)dx$.

A $-\frac{1}{3x^3}+c$

B $-\frac{3}{x^3}+c$

C $-\frac{1}{5x^5}+c$

D $\frac{5}{x^5}+c$

177

What is the value of $\int_0^2 (12+x^3)\,dx$?

A 8

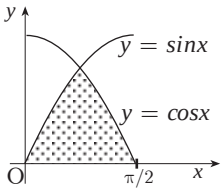
B 12

C 16

D 28

178

The diagram shows the curves with equations $y=\sin x$ and $y=\cos x$ for $0\le x\le\frac{\pi}{2}$.



Find an expression for the shaded area.

A $\int_0^{\frac{\pi}{4}}\sin x\ \ dx+\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}\cos x\ \ dx$

B $\int_0^{\frac{\pi}{2}}\left(\cos x-\sin x\right)\ \ dx$

C $\int_0^{\frac{\pi}{2}}\left(\sin x-\cos x\right)\ \ dx$

D $\int_0^{\frac{\pi}{2}}\left(\sin x+\cos x\right)\ \ dx$

179

If $\frac{dy}{dx}=x^2-4x$, express y in terms of x .

A $y=\frac{1}{3}x^3-2x^2+c$

B $y=2x-4+c$

C $y=x^2-4x+c$

D $y=x^3-4x^2+c$

180

A curve has equation $y = \cos x$.

What is the gradient of the curve at the point where $x = \dfrac{\pi}{2}$?

A $\quad -1$

B $\quad -\dfrac{\pi}{4}$

C $\quad 0$

D $\quad 1$

181

What is the derivative, with respect to x, of $\left(x^4 + 2x\right)^3$?

A $\quad 3\left(4x^3 + 2\right)^2$

B $\quad \frac{1}{4}\left(\frac{1}{5}x^5 + x^2\right)^4$

C $\quad 3\left(x^4 + 2x\right)^2\left(4x^3 + 2\right)$

D $\quad \frac{1}{4}\left(x^4 + 2x\right)^4\left(\frac{1}{5}x^5 + x^2\right)$

182

Find $\displaystyle\int \left(2x+1\right)^3 \; dx$.

A $\quad \dfrac{1}{4}\left(2x+1\right)^4 + c$

B $\quad \dfrac{1}{2}\left(2x+1\right)^4 + c$

C $\quad \dfrac{1}{8}\left(2x+1\right)^4 + c$

D $\quad \left(x^2 + x\right)^3 + c$

183

Find $\displaystyle\int (\sin 3x)\; dx$.

A $\quad -\cos 3x + c$

B $\quad -\dfrac{1}{3}\cos 3x + c$

C $\quad \dfrac{1}{3}\cos 3x + c$

D $\quad 3\cos 3x + c$

184

R and T are the points $(-2,3,1)$ and $(3,5,2)$ respectively.
What is the length of the line RT ?

A $\quad \sqrt{6}$

B $\quad \sqrt{24}$

C $\quad \sqrt{30}$

D $\quad \sqrt{74}$

185 The straight line joining the points A$(0,8)$ and B$(-4,0)$ passes through the point C$(p,-4)$.
What is the value of p ?

A -8
B -6
C -2
D 6

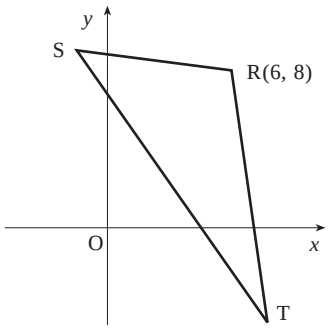
186 Find the equation of the line passing through the points with coordinates $(1,-2)$ and $(-3,4)$.

A $3x+2y+1=0$
B $3x-2y-7=0$
C $2x+3y+4=0$
D $2x-3y-8=0$

187 A line L has equation $3x+5y-8=0$.
What is the gradient of a line perpendicular to line L?

A $-\frac{3}{5}$
B $-\frac{1}{3}$
C $\frac{3}{5}$
D $\frac{5}{3}$

188 In triangle RST, R has coordinates (6, 8) and the gradient of ST is –2.



What is the equation of the altitude through R ?

A $y=\frac{1}{2}x+5$
B $y=-2x+20$
C $y=\frac{1}{2}x+2$
D $y=-2x+22$

189

What are the coordinates of the centre of the circle with equation $3x^2 + 3y^2 - 12x - 9y + 1 = 0$?

A $(12, 9)$
B $(6, 4\frac{1}{2})$
C $(4, 3)$
D $(2, 1\frac{1}{2})$

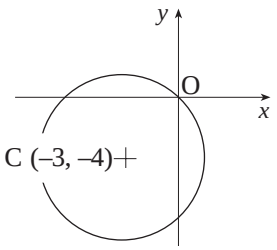
190

Circle P has equation $x^2 + y^2 - 4x + 6y - 1 = 0$.
Circle Q has equation $(x+1)^2 + (y-1)^2 = 16$.
Circle R has the same centre as circle P and the same radius as circle Q.
What is the equation of circle R?

A $(x+2)^2 + (y-3)^2 = 4$
B $(x-2)^2 + (y+3)^2 = 4$
C $(x-2)^2 + (y+3)^2 = 16$
D $(x+2)^2 + (y-3)^2 = 16$

191

A circle, centre C$(-3, -4)$, passes through the origin.



What is the equation of the tangent to the circle at the origin ?

A $y = \frac{4}{3}$
B $y = \frac{3}{4}x$
C $y = -\frac{3}{4}x$
D $y = -\frac{4}{3}x$

192

The line with equation $x = 2y + 5$ and the circle with equation $x^2 + y^2 - 6x - 3y - 5 = 0$ intersect at the points P and Q.
Which of the following equations will give the y-coordinates of P and Q ?

A $5y^2 + 5y - 10 = 0$
B $y^2 - 5y - 10 = 0$
C $2y^2 - 9y - 5 = 0$
D $y^2 - 13y - 30 = 0$

193

P is the point $(4,3,-1)$ and Q is $(-2,-1,3)$.
What is the length of PQ ?

A $\sqrt{6}$
B $\sqrt{12}$
C $\sqrt{24}$
D $\sqrt{68}$

194

P, Q and R have coordinates $(1,2,-1)$, $(4,3,0)$ and $(1,\ 4,\ 2)$ respectively.
If $\overrightarrow{RS} = 3\overrightarrow{PQ}$, what are the coordinates of S ?

A $(10,7,5)$
B $(19,19,-1)$
C $(-10,-7,-5)$
D $(-8,-5,-1)$

195

$\boldsymbol{a}$ has components $\begin{pmatrix} \frac{6}{7} \\ -\frac{3}{7} \\ z \end{pmatrix}$. If $\boldsymbol{a}$ is a unit vector find the values of z .

A $\pm\frac{4}{7}$
B $\pm\frac{3}{7}$
C $\pm\frac{2}{7}$
D $\pm\frac{1}{7}$

196

Vectors $\boldsymbol{u} = 2\boldsymbol{i} - 4\boldsymbol{j} - 8\boldsymbol{k}$ and $\boldsymbol{v} = 5\boldsymbol{i} + p\boldsymbol{j} - 20\boldsymbol{k}$ are parallel.
What is the value of p?

A 10
B -1
C -7
D -10

197

$\boldsymbol{u}$ and $\boldsymbol{v}$ have components $\begin{pmatrix}1\\0\\1\end{pmatrix}$ and $\begin{pmatrix}2\\-4\\0\end{pmatrix}$ respectively.

If $3(\boldsymbol{x}+\boldsymbol{u}) = 2\boldsymbol{v} + \boldsymbol{x}$, find the components of $\boldsymbol{x}$.

A $\begin{pmatrix}1\\-8\\-3\end{pmatrix}$

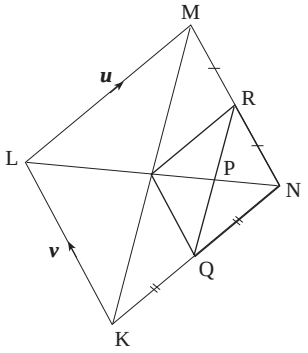
B $\begin{pmatrix}\frac{3}{2}\\-4\\-\frac{1}{2}\end{pmatrix}$

C $\begin{pmatrix}\frac{1}{2}\\-4\\-\frac{1}{2}\end{pmatrix}$

D $\begin{pmatrix}\frac{1}{2}\\-4\\-\frac{3}{2}\end{pmatrix}$

198

KLMN is a parallelogram as shown in the diagram.
Q is the midpoint of KN and R is the midpoint of MN.



If $\overrightarrow{\text{LM}} = \boldsymbol{u}$ and $\overrightarrow{\text{KL}} = \boldsymbol{v}$, find an expression for $\overrightarrow{\text{NP}}$.

A $\overrightarrow{\text{NP}} = -\frac{1}{4}(u+v)$

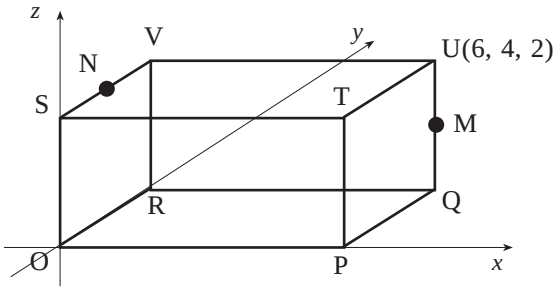
B $\overrightarrow{\text{NP}} = \frac{1}{4}(v-u)$

C $\overrightarrow{\text{NP}} = \frac{1}{4}(u-v)$

D $\overrightarrow{\text{NP}} = \frac{1}{4}(u+v)$

199

The diagram shows a cuboid OPQRSTUV.
The coordinates of U are $(6, 4, 2)$.
M and N are the midpoints of UQ and SV .



What are the components of $\overrightarrow{MN}$?

A $\begin{pmatrix} 6 \\ 2 \\ -1 \end{pmatrix}$

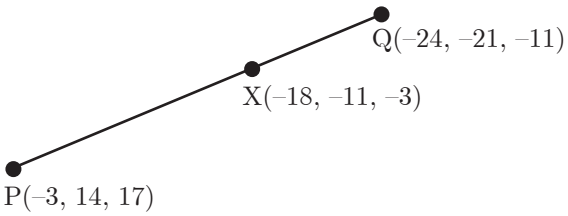
B $\begin{pmatrix} -6 \\ 1 \\ -2 \end{pmatrix}$

C $\begin{pmatrix} 1 \\ -6 \\ -2 \end{pmatrix}$

D $\begin{pmatrix} -6 \\ -2 \\ -1 \end{pmatrix}$

200

P,X and Q are collinear points with coordinates as shown in the diagram.

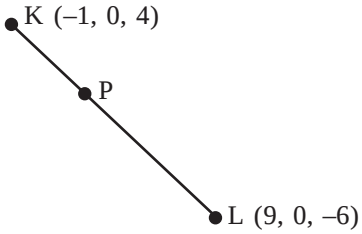


In what ratio does X divide PQ ?

A 5 : 2
B 5 : 7
C 2 : 7
D 2 : 5

201

K and L have coordinates $(-1,0,4)$ and $(9,0,-6)$ as shown in the diagram.
P divides KL in the ratio 2:3.



What are the coordinates of P?

A $(5,0,-2)$

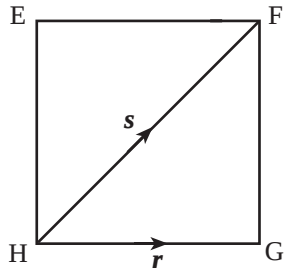
B $(3,0,0)$

C $\left(\frac{16}{5},0,-\frac{4}{5}\right)$

D $(4,0,-4)$

202

EFGH is a square of side 1 unit as shown in the diagram.
$\overrightarrow{HG} = \boldsymbol{r}$ and $\overrightarrow{HF} = \boldsymbol{s}$.



What is the value of $\boldsymbol{r}.\boldsymbol{s}$?

A $\frac{1}{\sqrt{2}}$

B $\sqrt{\frac{2}{3}}$

C 1

D 2

203

Vectors $\boldsymbol{u}$ and $\boldsymbol{v}$ are defined by $\boldsymbol{u} = \begin{pmatrix} g \\ 3 \\ 2 \end{pmatrix}$ and $\boldsymbol{v} = \begin{pmatrix} 5 \\ -4 \\ -g \end{pmatrix}$.

If $\boldsymbol{u}$ and $\boldsymbol{v}$ are perpendicular, what is the value of g ?

A 4

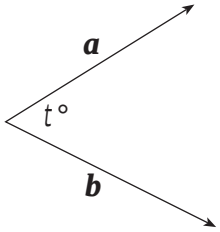
B $\frac{13}{3}$

C -4

D $\frac{12}{7}$

204

The diagram shows two vectors, $\boldsymbol{a}$ and $\boldsymbol{b}$, inclined at angle of $t°$.
$|\boldsymbol{a}| = |\boldsymbol{b}| = \sqrt{2}$ units and $\boldsymbol{a}.\boldsymbol{b} = \sqrt{3}$

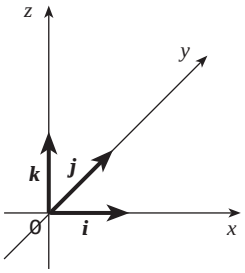


What is the value of t ?

A 30
B 45
C 60
D 90

205

The diagram shows three unit vectors, $\boldsymbol{i}$, $\boldsymbol{j}$ and $\boldsymbol{k}$.



What is the value of $\boldsymbol{i}.(\boldsymbol{i} + 2\boldsymbol{j} - \boldsymbol{k})$?

A 0
B 1
C 2
D 4

206

For $0 \leq x \leq \pi$, the maximum value of $\sin\left(2x - \frac{\pi}{4}\right)$ occurs when $x = t$.

What is the value of t ?

A $\frac{\pi}{8}$
B $\frac{3\pi}{8}$
C $\frac{\pi}{2}$
D $\frac{3\pi}{4}$

207

What is the exact value of $\sin\left(\frac{7\pi}{6}\right) - \sin\left(\frac{5\pi}{6}\right)$?

A -1

B $-\sqrt{3}$

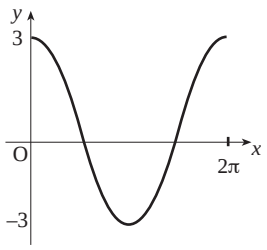
C $\frac{\sqrt{3}}{2}$

D 0

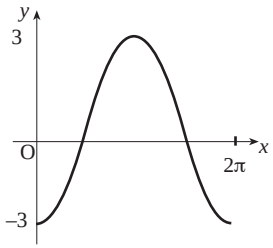
208

Which of the sketches below shows the graph with equation $y = 3\sin\left(x - \frac{\pi}{2}\right)$?

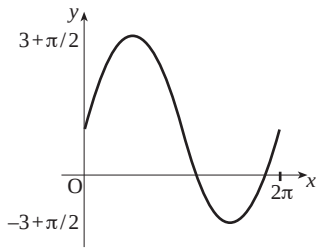
A



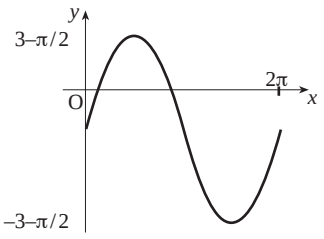
B



C



D



209

A minimum value of $1-\cos\left(x-\frac{\pi}{3}\right)$ occurs when $x = t$, where $0 \leq t \leq \frac{3\pi}{2}$.

What is the value of t ?

A 0

B $\frac{\pi}{3}$

C π

D $\frac{4\pi}{3}$

210

What is the solution to the equation $2\sin^2 x = 1$

in the interval $0 \leq x < \frac{\pi}{2}$?

A $\frac{\pi}{4}$

B $\sqrt{\frac{\pi}{6}}$

C $\frac{\pi}{6}$

D $\frac{\pi}{3}$

211

What is the value of $\cos(45° - 30°)$?

A $\frac{\sqrt{3}-1}{2\sqrt{2}}$

B $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C $\frac{\sqrt{3}-1}{2}$

D $\frac{\sqrt{2}-\sqrt{3}}{2}$

212

Given that $\sin x = k$, where $0 \leq x < \frac{\pi}{2}$, find an expression for $\sin 2x$.

A $\sin 2x = 2k$

B $\sin 2x = 2k\sqrt{1-k^2}$

C $\sin 2x = 2k\sqrt{1+k^2}$

D $\sin 2x = 2k^2 - 1$

213

k and a are given by $\quad k\cos a^\circ = \sqrt{3} \quad$ and $\quad k\sin a^\circ = 1$
where $k > 0$ and $0 \leq a < 90$.
What are the values of k and a ?

	k	a
A	4	60
B	4	30
C	2	60
D	2	30

214

$2\sin x - 3\cos x$ is expressed in the form $k\cos x\cos a + k\sin x\sin a$
where k and a are constants and $0 \leq a \leq 2\pi$.
What is the value of $\tan a$?

A $\quad -\frac{3}{2}$

B $\quad -\frac{2}{3}$

C $\quad \frac{2}{3}$

D $\quad \frac{3}{2}$