1M1 Mathematics Answers 1

Qu.1.(i) $1/(125a^3)$; (ii) 9; (iii)1.
Qu.2. (i) $a^n b^{4n}$; (ii) $12a^2b$; (iii) $x^{10}y^{10}$; (iv) a^2+b^2; (v) 1.
Qu.3. (i) 13; (ii) 5; (iii) 3; (iv) 0.3; (v) $\frac{4}{11}$ (vi) $-\frac{1}{3}$; (vii) ab^2;
Qu4. (i) $6\sqrt{5}$; (ii) $5+2\sqrt{6}$.
Qu.5 (i) 7; (ii) 2; (iii) 216; (iv) 36; (v) $\frac{1}{4}$; (vi) 27; (vii) 10.
Qu.6.(i) $5a^3/b$; (ii) $16a^2b$; (iii) ab; (iv) $a^2/6$; (v) $a-b$; (vi) $3b^2c^2/\left(4a^2\right)$.
Qu.7. $b=x^{3/2}y^{-1}$.
Qu.8. (a) $\log_4 16=2$; $\log_3 81=4$; $\log_{32}16=\frac{4}{5}$; (b) $10^1=10$; $2^3=8$; $5^{-2}=\frac{1}{25}$; (c) 32; $\frac{1}{16}$; 49.
Qu.9. (i) 4; (ii) $\frac{3}{2}$; (iii) 3.
Qu.10. (i)10,000; (ii) 64.
Qu11. (i) 2, (ii) $\frac{3}{2}$, (iii) 1.
Qu.12. $2\log_{10}a+3\log_{10}b-2-\frac{1}{2}\log_{10}c$.
Qu.13. $y=100/x^3$.
Qu.14. (i) $\log 12$; (ii) $\log(c/b)$; (iii) $\log y$.

1M1 Mathematics Answers 2

Qu.2 (i) $2\cos x+1$; (ii) $\ln 2+\ln(x+1)$.
Qu.3 4.0535.
Qu.4 1.10, 0.
Qu.5 (i) $\left(x+\frac{1}{2}\right)^2-\frac{9}{4}$ (ii) $-\left(x-\frac{1}{8}\right)^2+\frac{1}{16}$ (iii) $2\left(x-\frac{1}{4}\right)^2+\frac{31}{8}$ (iv) $-4(x+1)^2+5$.
Qu.6 $c\geq\frac{25}{4}$.
Qu.7 (i)

$$\frac{1}{3}\left(\frac{4}{x-1}-\frac{1}{x+2}\right),$$

(ii)

$$-\frac{1}{x+1}+\frac{x+1}{x^2+1},$$

(iii)

$$\frac{1}{x-1}+\frac{1}{(x-1)^2},$$

(iv)

$$-\frac{4}{x+1}+\frac{1}{(x+1)^2}+\frac{4}{x+2}+\frac{4}{(x+2)^2}.$$

1M1 Mathematics Answers 3

Qu.1 $2x-1+\frac{1}{x-3}-\frac{1}{(x-3)^2}$.
Qu.2 1.60064×10^{-7}.
Qu.6 (i) 2.
Qu.7 2.
Qu.8 $(-1,-4)$.
Qu.9 5 units, $\frac{4}{3}$.
Qu.10 $(3,-2)$, 4.
Qu.11 (i) $y=1-x^2$, $-1<x<1$. (ii) $y=x^2$, $x>0$. (iii) $y=\pm x^{3/2}$, $x\geq 0$.
(iv) $y=1+x^2$, $-\infty<x<\infty$. Q
Qu.12. $(\sqrt{2},\ \pi/4)$, $(\sqrt{2},3\pi/4)$, $(2,-\pi/6)$.

1M1 Mathematics Answers 4

Qu.1 $(2,-1)$, 4, Qu.2.(i)

$$\frac{x\cos x-\sin x}{x^2}$$

.(ii)

$$\frac{-x^4+2x^3+3x^2+4x-2}{\left(x^2+2\right)^2\left(x+1\right)^2}$$

(iii) $\ln 3\frac{3^{\ln x}}{x}$ or $(\ln 3)\,x^{\ln 3-1}$ (iv)

$$\frac{2ax+b}{ax^2+bx+c}$$

Qu.3 (i) $-\sin x\cos(\cos x)$.(ii) $\frac{3(1-\cos 3x)}{\sin^2 3x}$(iii) 0.
(iv) $ex^{e-1}+e^x$.(v) e^{x+e^x}.Qu.4 (i) $10x\cos 5x^2$, $10\cos 5x^2-100x^2\sin 5x^2$.
(ii) $(x+1)^{-2}$, $-2(x+1)^{-3}$.
(iii)$x/\left(x^2+4\right)^{1/2}$, $4\left(x^2+4\right)^{-3/2}$ Qu.5. (i) $2xe^x+x^2e^x=\left(x^2+2x\right)e^x$.
(ii) $\left(x^2+4x+2\right)e^x$.
(iii) $\left(x^2+6x+6\right)e^x$.
Qu.6 (i) $\left(\frac{2}{3},\frac{1}{27}\right)$,maximum;$(1,0)$, minimum.
(ii) $\left(2\pm\sqrt{2},3\pm\sqrt{2}\right)$, $x=2-\sqrt{2}$ a maximum, $x=2+\sqrt{2}$ a minimum.
(iii) No stationary points.
Qu.7 (i) $2/\sqrt{1-4x^2}$, (ii) $5/\left(25+x^2\right)$.
Qu.8 (i)

$$(x+1)^2(x+2)^3(x+3)^4\left(\frac{2}{x+1}+\frac{3}{x+2}+\frac{4}{x+3}\right).$$

(ii)

$$3\sqrt{3x^2+2}\sqrt{6x-7}\left(\frac{x}{3x^2+2}+\frac{1}{6x-7}\right).$$

Qu.9 (i)

$$-\frac{2x+y}{2y+x}, -\frac{2\left[1+y'+(y')^2\right]}{2y+x}.$$

(ii)

$$\frac{2x\left(1-y^3\right)}{3\left(1+x^2y^2\right)}.$$

Qu.10 $y'=1$, $y''=2\sqrt{2}$ at $t=\pi/4$. .
Qu.11.

$$\frac{1}{Q}\left(M\omega-\frac{K}{\omega}\right)\left(M+\frac{K}{\omega^2}\right);$$

$\omega=\sqrt{K/M}$, $Q=L$, a minimum.

1M1 Mathematics Answers 5

Qu.1.(i) $-\frac{1}{2\pi}\cos 2\pi x+c$; 0. (ii) $\frac{1}{5}e^{5x}+c$; $\frac{e^5-1}{5}$.
(iii) $2\left(1+x\right)^{1/2}+c$. $2\left(\sqrt{2}-1\right)$; (iv) $\frac{1}{4\pi}\sin^2 2\pi x+c=-\frac{1}{4\pi}\cos^2 2\pi x+c=-\frac{1}{8\pi}\cos 4\pi x+c$; 0.
Qu.2. (i) $\frac{1}{24}\left(2x^2-3\right)^6+c$; (ii) $-\frac{1}{3}\left(9-z^2\right)^{3/2}+c$;
(iii) $\frac{1}{2}\frac{1}{3-2v}+c$; (iv) $-\frac{12}{5}\left(4-5t\right)^{-1/2}+c$
(v) 0.0665; (vi) $\frac{1}{2}e^{x^2}+c$
(vii) $\frac{1}{3}\sec 3x+c$. (viii) $\ln 2-\frac{3}{8}$
Qu.3 (i) $2\sin^{-1}\left(\frac{x}{2}\right)-\frac{1}{2}x\sqrt{4-x^2}+c$. (ii) $-\frac{\sqrt{4-x^2}}{x}-\sin^{-1}\left(\frac{x}{2}\right)+c$.
Qu.4 (i) $-2\left(x+1\right)e^{-x}+c$. (ii) $\frac{1}{4}x^2\sin 4x+\frac{1}{8}x\cos 4x-\frac{1}{32}\sin 4x+c$.
(iii) $x\tan^{-1}x-\frac{1}{2}\ln\left(1+x^2\right)+c$ (iv) $I=x\left(\ln x\right)^2-2x\left(\ln x-x\right)+c$
(v) $\frac{1}{11}\left(x+1\right)^{11}\left(x+2\right)-\frac{1}{132}\left(x+1\right)^{12}+c$. (vi) $\frac{2}{5}\left(1-e^{-\pi}\right)$.
Qu.5 (i) $\frac{b}{a^2}\ln\left|\frac{a+bu}{u}\right|-\frac{1}{au}+c$. (ii) $\frac{1}{2}\pi$. (iii) $\ln\frac{3}{2}-\frac{5}{12}$.
Qu.6 (i) $\frac{1}{2}\sin^{-1}\left(\frac{2x-1}{2\sqrt{2}}\right)+c$. (ii) $2\left(\sqrt{x-1}-\tan^{-1}\sqrt{x-1}\right)+c$. (iii) $\sin^{-1}\left(\frac{x-1}{\sqrt{2}}\right)-\sqrt{1+2x-x^2}+c$