E Michaelmas Pre Trial Practice

No calculators allowed.

1. Indices:

   (a) 4^{-2}. $\boxed{\frac{1}{16}}$

   (b) 1.5^{-1}. $\boxed{\frac{2}{3}}$

   (c) $32^{-\frac{3}{5}}$. $\boxed{\frac{1}{8}}$

   (d) 49^{0}. $\boxed{1}$

   (e) $\left(\frac{4}{9}\right)^{\frac{3}{2}}$. $\boxed{\frac{8}{27}}$

   (f) $\left(\frac{1}{8}\right)^{-\frac{2}{3}}$. $\boxed{4}$

   (g) $\dfrac{1}{\left(\frac{2}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{\frac{1}{2}}}$. $\boxed{\frac{4}{11}}$

2. Expand & simplify:

   (a) $-2x^2(8-x^3)$. $\boxed{-16x^2+2x^5}$

   (b) $(2x-3)(x-6)$. $\boxed{2x^2-15x+18}$

   (c) $(4-x)(5-6x)$. $\boxed{6x^2-29x+20}$

   (d) $(3a-2b)^2$. $\boxed{9a^2-12ab+4b^2}$

   (e) $(x-3)^3$. $\boxed{x^3-9x^2+27x-27}$

   (f) $x^2-y^2-(x-2y)(x+y)$. $\boxed{y^2+xy}$

   (g) $(x+3y)^2-(x-2y)^2$. $\boxed{5y^2+10xy}$

   (h) $\left(2x-\frac{3}{x}\right)(x+\frac{4}{x})$. $\boxed{2x^2+5-\frac{12}{x^2}}$

   (i) $\left(\frac{2}{a}+a\right)(3a-\frac{6}{a})$. $\boxed{3a^2-\frac{12}{a^2}}$

3. Factorise *fully*:

   (a) $6x^2-3x$. $\boxed{3x(2x-1)}$

   (b) $7x^3-21x^2$. $\boxed{7x^2(x-3)}$

   (c) $2\pi x^2-98\pi$. $\boxed{2\pi(x+7)(x-7)}$

   (d) x^4-16. $\boxed{(x-2)(x+2)(x^2+4)}$

4. Solve:

   (a) $-2x^2=3x$. $\boxed{x=0 or x=-\frac{3}{2}}$

   (b) $-x^2+200=100$. $\boxed{x=10 or x=-10}$

   (c) $u^2=18-7u$. $\boxed{u=2 or u=-9}$

   (d) $2\pi x^2-3\pi x=9\pi$. $\boxed{x=3 or x=-\frac{3}{2}}$

   (e) $\dfrac{6}{x+1}-\dfrac{7}{x-2}=10$. $\boxed{x=1 or x=\frac{1}{10}}$

   (f) $\dfrac{4}{x}-\dfrac{3x}{2}=-1$. $\boxed{x=2 or x=-\frac{4}{3}}$

   (g) $(x+3)^2=(x-4)^2$. $\boxed{x=\frac{1}{2}}$

   (h) $5x^2-(2x+5)^2=(7-x)(1-x)$. $\boxed{x=-\frac{16}{7}}$

   (i) $\dfrac{x}{2}-\dfrac{x-1}{4}=7+x$. $\boxed{x=-9}$

   (j) $x-\dfrac{2-x}{3}=\dfrac{3x+2}{4}-0.5$. $\boxed{x=\frac{8}{7}}$

   (k) $0.25x=0.0625$. $\boxed{x=\frac{1}{4}}$

5. Solve:

   (a) $5^{x-1}=\frac{1}{125}$. $\boxed{x=-2}$

   (b) $2^x+2^x=\frac{1}{32}$. $\boxed{x=-6}$

   (c) $9^x=\dfrac{3^x}{27^{x-3}}$. $\boxed{x=\frac{9}{4}}$

   (d) $\dfrac{1}{16^2}=\dfrac{2^{x-1}}{4^{x-2}}$. $\boxed{x=11}$

   (e) $49^{x-2}=7\times\dfrac{1}{7^{2x-3}}$. $\boxed{x=2}$

   (f) $\dfrac{2^x}{4^{x+2}}=\dfrac{16^x}{8^{x-2}}$. $\boxed{x=-5}$

6. Solve the following simultaneous equations for x and y:

(a) $\begin{matrix} x + 4y = 2 \\ 3x - 2y = 1 \end{matrix}$. $\boxed{(x, y) = (\frac{4}{7}, \frac{5}{14})}$

(b) $\begin{matrix} 3x - 2y = -1 \\ 4x + 3y = 2 \end{matrix}$. $\boxed{(x, y) = (\frac{1}{17}, \frac{10}{17})}$

(c) $\begin{matrix} 0.2x + 0.4y = 0.8 \\ 0.6x - 0.8y = 0.2 \end{matrix}$. $\boxed{(x, y) = (\frac{9}{5}, \frac{11}{10})}$

(d) $\begin{matrix} ax - y = 2 \\ x + y = 3 \end{matrix}$. $\boxed{(x, y) = (\frac{5}{a+1}, \frac{3a-2}{a+1})}$