

E Michaelmas Pre Trial Practice

No calculators allowed.

1. Indices:

(a) 4^{-2} .	$\frac{1}{16}$	(e) $\left(\frac{4}{9}\right)^{\frac{3}{2}}$.	$\frac{8}{27}$
(b) 1.5^{-1} .	$\frac{2}{3}$	(f) $\left(\frac{1}{8}\right)^{-\frac{2}{3}}$.	4
(c) $32^{-\frac{3}{5}}$.	$\frac{1}{8}$	(g) $\frac{1}{\left(\frac{2}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{\frac{1}{2}}}$.	$\frac{4}{11}$
(d) 49^0 .	1		

2. Expand & simplify:

(a) $-2x^2(8 - x^3)$.	$-16x^2 + 2x^5$	(f) $x^2 - y^2 - (x - 2y)(x + y)$.	$y^2 + xy$
(b) $(2x - 3)(x - 6)$.	$2x^2 - 15x + 18$	(g) $(x + 3y)^2 - (x - 2y)^2$.	$5y^2 + 10xy$
(c) $(4 - x)(5 - 6x)$.	$6x^2 - 29x + 20$	(h) $\left(2x - \frac{3}{x}\right)\left(x + \frac{4}{x}\right)$.	$2x^2 + 5 - \frac{12}{x^2}$
(d) $(3a - 2b)^2$.	$9a^2 - 12ab + 4b^2$	(i) $\left(\frac{2}{a} + a\right)\left(3a - \frac{6}{a}\right)$.	$3a^2 - \frac{12}{a}$
(e) $(x - 3)^3$.	$x^3 - 9x^2 + 27x - 27$		

3. Factorise *fully*:

(a) $6x^2 - 3x$.	$3x(2x - 1)$	(c) $2\pi x^2 - 98\pi$.	$2\pi(x + 7)(x - 7)$
(b) $7x^3 - 21x^2$.	$7x^2(x - 3)$	(d) $x^4 - 16$.	$(x - 2)(x + 2)(x^2 + 4)$

4. Solve:

(a) $-2x^2 = 3x$.	$x = 0 \text{ or } x = -\frac{3}{2}$	(g) $(x + 3)^2 = (x - 4)^2$.	$x = \frac{1}{2}$
(b) $-x^2 + 200 = 100$.	$x = 10 \text{ or } x = -10$	(h) $5x^2 - (2x + 5)^2 = (7 - x)(1 - x)$.	$x = -\frac{16}{7}$
(c) $u^2 = 18 - 7u$.	$u = 2 \text{ or } u = -9$	(i) $\frac{x}{2} - \frac{x - 1}{4} = 7 + x$.	$x = -9$
(d) $2\pi x^2 - 3\pi x = 9\pi$.	$x = 3 \text{ or } x = -\frac{3}{2}$	(j) $x - \frac{2 - x}{3} = \frac{3x + 2}{4} - 0.5$.	$x = \frac{8}{7}$
(e) $\frac{6}{x + 1} - \frac{7}{x - 2} = 10$.	$x = 1 \text{ or } x = \frac{1}{10}$	(k) $0.25x = 0.0625$.	$x = \frac{1}{4}$
(f) $\frac{4}{x} - \frac{3x}{2} = -1$.	$x = 2 \text{ or } x = -\frac{4}{3}$		

5. Solve:

(a) $5^{x-1} = \frac{1}{125}$.	$x = -2$	(d) $\frac{1}{16^2} = \frac{2^{x-1}}{4^{x-2}}$.	$x = 11$
(b) $2^x + 2^x = \frac{1}{32}$.	$x = -6$	(e) $49^{x-2} = 7 \times \frac{1}{7^{2x-3}}$.	$x = 2$
(c) $9^x = \frac{3^x}{27^{x-3}}$.	$x = \frac{9}{4}$	(f) $\frac{2^x}{4^{x+2}} = \frac{16^x}{8^{x-2}}$.	$x = -5$

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

$$(a) \begin{cases} x + 4y = 2 \\ 3x - 2y = 1 \end{cases}$$

$$(x, y) = \left(\frac{4}{7}, \frac{5}{14}\right)$$

$$(b) \begin{cases} 3x - 2y = -1 \\ 4x + 3y = 2 \end{cases}$$

$$(x, y) = \left(\frac{1}{17}, \frac{10}{17}\right)$$

$$(c) \begin{cases} 0.2x + 0.4y = 0.8 \\ 0.6x - 0.8y = 0.2 \end{cases}$$

$$(x, y) = \left(\frac{9}{5}, \frac{11}{10}\right)$$

$$(d) \begin{cases} ax - y = 2 \\ x + y = 3 \end{cases}$$

$$(x, y) = \left(-\frac{5}{a+1}, \frac{3a-2}{a+1}\right)$$