

# Practice Fundamental Skills Module

MAT 1330

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## *Polynomial simplification*

Simplify the following polynomials:

1.

$$\frac{\sqrt{x^5 y^7}}{x^3 y^{1/4}}$$

2.

$$\frac{3 + \frac{5}{x}}{\frac{6}{x} - 1}$$

3.

$$\frac{\frac{k+1}{k} + \frac{1}{k}}{\frac{k}{k+1} - \frac{k}{k+2}}$$

4.

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

## *Factoring*

Factor the following:

5.

$$6x^2 - 5x - 4$$

6.

$$x^3 + 1000$$

## *Rationalising*

Rationalise the denominator:

7.

$$\frac{\sqrt{x^3 y} \cdot \sqrt{xy}}{\sqrt{x^3 y^3}}$$

8.  $\frac{1}{\sqrt{8}-5}$
9.  $\frac{1}{2+\sqrt{3}}$
10.  $\frac{1}{\sqrt{13}+\sqrt{6}}$

*Graphs of functions*

11. Sketch  $y = |x + 3| - 2$
12. Sketch  $y = -(x - 2)^2 + 1$

*Trigonometric graphs*

13. Sketch  $y = 1 + 3 \cos\left(\frac{2\pi}{3}(t - 2)\right)$
14. Sketch  $y = -2 + 0.5 \cos\left(\frac{2\pi}{5}(t - 3)\right)$

*Transforming functions*

15. If  $f(x) = 3x - 6$ , find  $f(3x - 6)$ .
16. Can a function be even and odd at the same time? (If yes, give an example.)

*Equation of a line*

17. Find the equation of the line through  $(-2, 1)$  and  $(-3, 4)$ .

*Domain and range*

Find the domain and range of the following functions:

18.  $y = x^2 - 1$
19.  $y = \sqrt{x + 2} - 3$
20.  $y = \frac{1}{x - 6}$

21.

$$y = \frac{1}{\sqrt{x-2}}$$

22.

$$y = \frac{1}{e^{x+1}}$$

23.

$$y = \sqrt{\ln(x+2)}$$

*Exponents and logs*

24. Solve  $3^{x-2} = 27^{x+5}$

25. Simplify  $\log_4(x-3) - \log_4 x + 2 \log_4 3$

26. Solve  $4^{3x+2} = 5^{2x-7}$

27. Solve  $\log_7(x+5) - \log_7(x-1) = \log_7(x+1)$

28. Solve  $2 \ln x - \ln(x+4) = \ln 2$

*Quadratics*

Solve the following:

29.

$$x = \sqrt{x+6}$$

30.

$$x = \sqrt{2x+15}$$

31.

$$12m^{-2} + m^{-1} = 2$$

32.

$$\sqrt{y+2} - \sqrt{2y+5} = -1$$

33.

$$(x^2+6)^{1/4} = x$$

*Absolute value*

Solve the following:

34.

$$|x^2 - 9| = 7$$

35.  $|x^2 + 9| = 7$

*Absolute value inequalities*

Solve the following:

36.  $|2x - 1| < 5$

37.  $|2x - 1| > 5$

38.  $|5x - 3| - 7 > 4$

39.  $6 - |2x + 1| > -5$

40.  $|7 - 8x| \geq -9$

41.  $|6x - 9| < -8$

42.  $|7x + 21| = 0$

*Function inequalities*

43.  $\frac{3x - 2}{4x + 1} > 5$

44.  $\frac{x + 1}{x - 2} \leq 7$

*Trigonometric functions*

45. In the range  $(0, \pi)$ , when is  $\sin x < \cos x$ ?

46. When does  $\cos(4x) = \frac{1}{2}$  in the range  $(0, \pi)$ ?

*Trig definitions*

47. If  $\tan \theta = \frac{12}{5}$  and  $\theta$  is in the third quadrant, find  $\sin \theta$  and  $\cos \theta$ .

48. If  $\sin x = y$ , find  $\cos x$  and  $\tan x$ .
49. Convert  $210^\circ$  to radians and  $\frac{3\pi}{4}$  to degrees.
50. Find a polynomial of degree 3 that satisfies  $f(2) = 4$  and has roots at  $x = -2, 1, 3$ .