Practice Fundamental Skills Module

MAT 1330

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Polynomial simplification
Simplify the following polynomials:

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

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

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 θ 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° 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 $x = -2, 1, 3$.