

1. Solve the equations. (a) $\sqrt{x + 16} = 3 + \sqrt{x - 5}$ (b) $x - 7 = \sqrt{2x + 1}$
2. $z = 8 - 3i$, $w = 2 + 5i$. Find (a) the sum, $z + w$ (b) the difference, $z - w$
- (c) the product, zw (d) the quotient, $\frac{z}{w}$

3. Find all complex number solutions of $x^2 + 10x + 34 = 0$

4. Find the **domain** and **range** for each of the following relations.

(a) $\{(1, 3), (2, -3), (5, 3)\}$

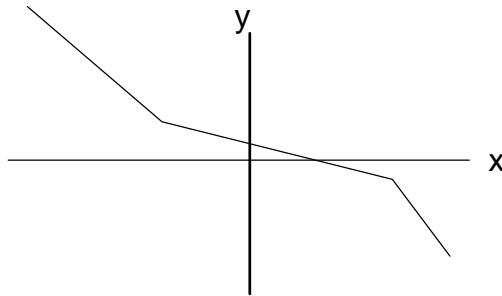
(b) $y = 2 + \sqrt{x - 4}$

5. Determine if each of the functions below is **one-to-one** or not, giving a **valid reason** in each case.

(a) $\{(1, 3), (2, -3), (5, 4)\}$

(b) $\{(2, 6), (3, 5), (4, 9), (7, 6)\}$

(c)



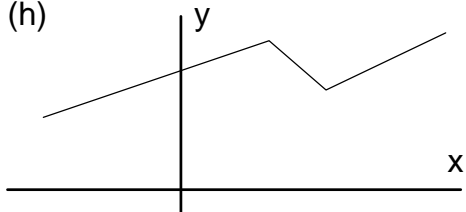
(d) $y = x^6 + 7$

(e) $y = 6x + 7$

(f) $x^7 - 5y^3 = 6$

(g) $|x| + y = 4$

(h)



6. If $f(x) = \frac{x + 5}{2x - 3}$ and $g(x) = 3x - 4$ find (a) $f \circ g(x)$ (b) $g^{-1}(x)$

(c) $f^{-1}(x)$

(d) the **domain** of f

(e) the **range** of f

7. Compute (a) $16^{3/2}$

(b) $16^{-3/4}$ (fraction answer.)

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8. Simplify (a) $\sqrt{108x^5y^6}$ (b) $\sqrt[3]{108x^5y^6}$

9. Rationalize the denominator and simplify (a) $\frac{2\sqrt{6}}{\sqrt{15}}$ (b) $\frac{3\sqrt{5} - \sqrt{2}}{\sqrt{5} - \sqrt{2}}$

10. Consider the parabola $y = x^2 - x - 12$

(a) Find the (x, y) coordinates of the **vertex**

(b) Draw a graph of the parabola with coordinates of vertex and all intercepts.

11. Solve the equation $x^{2/3} - x^{1/3} - 12 = 0$

12. Solve the inequality $\frac{(x-2)}{(x+1)(x-4)} \leq 0$

13. Given $f(x) = 2x^2 + 7$ and $g(x) = 3x - 2$ find standard polynomial form for

(a) $(f + g)(x)$ (b) $(fg)(x)$ (c) $g \circ f(x)$ (d) $g^{-1}(x)$

14. Find the **exact** value of $\log_{27} \left(\frac{1}{243} \right)$, in **fraction** form.

15. Find the **exact** value of $e^{[5 \ln(3)]}$, in **decimal** form.

16. **Expand** $\log \left(\frac{\sqrt[5]{y}}{x^4w^3} \right)$, using properties of \log . ($w, x, y > 0$.)

17. **Solve** the equation $2.5 = 4.0 \cdot e^{-0.2t}$. (a) **exact expression**

(b) **calculator approximation** to **six** significant digits or more.

18. We deposit \$1500 in an account with a 4.8 % nominal annual interest rate. Find **how long**, to the nearest hundredth of a year, will it take for the money to grow to \$6000, based on

(a) **annual compounding** (b) **continuous compounding**

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19. A substance decays exponentially. Initially there are 200 grams. After 8 hours there are 80 grams left. Using the formula $Q = Q_0 e^{-kt}$, where Q is the quantity at time t , and t is the time in hours, find

- (a) the value of k , to the accuracy of your calculator
- (b) the **half-life**, to the nearest hundredth of an hour.

20. Find the (x, y) -coordinates of the **points of intersection** of the graphs of

$$y = 3x^2 \quad \text{and} \quad 9x = y^2$$

21. (a) Consider the **parabola** $x = 2y^2 - 16y + 12$ and find the (x, y) -coordinates of the **vertex**.

(b) Write down the **standard equation of a circle** with center at $(4, -7)$ and radius 8.

22. Given the equation $x^2 + y^2 + 10x - 6y - 15 = 0$,

(a) complete the squares to find the **standard equation** of the **circle**

(b) give the **radius** (c) give the (x, y) - coordinates of the **center**

23. Consider the **hyperbola** $\frac{x^2}{25} - \frac{y^2}{16} = 1$.

(a) Find the (x, y) - coordinates of the **vertices**. (b) **Solve** for y , in terms of x

(c) Find the **equations** of the **asymptotes**.

24. Consider the **ellipse** $\frac{x^2}{49} + \frac{y^2}{16} = 1$. (a) Find the **x-intercepts**.

(b) Find the **y-intercepts**. (c) Find the **foci** (d) **Solve** for y , in terms of x

(e) Complete the table below, giving y to two decimal places.

x	0	1	2	3	4	5	6	7
y								

(f) Draw an accurate **graph** of the ellipse, showing vertices, and points from the table, with their mirror images in the axes.

(100 points, total.)