1. Which of the following are irrational numbers π, $\frac{22}{7}$, -1.5, $0.\dot{3}$, $\tan 30°$.

2. Simplify $(3\sqrt{6})^2$.

3. Simplify $\dfrac{6\sqrt{18}}{2\sqrt{2}}$.

4. Find $0.23\dot{7}$ as a simplified fraction.

5. Simplify $\sqrt{54} + 2\sqrt{12} - \sqrt{24} - \sqrt{27}$.

6. Find the value of c and d if $(2\sqrt{3} + 4)^2 = c + d\sqrt{2}$ where c and d are rational.

7. Simplify $\dfrac{\sqrt{2}}{1 - \sqrt{2}} - \dfrac{\sqrt{2}}{1 + \sqrt{2}}$.

8. Find the value of a and b if $\dfrac{2}{\sqrt{5} - 1} = a + \sqrt{b}$ where a and b are rational.

9. On seperate axes sketch the following relations.
   (a) $y = 3x$
   (b) $2x + 3y = 6$
   (c) $y = 3^{-x}$
   (d) $y = 9 - x^2$
   (e) $(x - 3)^2 + y^2 = 9$
   (f) $y = \dfrac{4}{x}$,

10. Sketch the function $y = \sqrt{9 - x^2}$. State its domain and range.

11. Sketch the parabola $y = x^2 - 6x + 8$ showing the roots, y-intercept and vertex.

12. Sketch the hyperbola $y = 2 + \dfrac{4}{x - 1}$ showing the asymptotes and intercepts with the axes.

13. Find the inverse function of $f(x) = \dfrac{x}{2x - 1}$. State the domain and range of the inverse function.

14. On separate axes sketch:
   (a) $y = \sqrt{x}$,
   (b) $y = -\sqrt{x}$,
   (c) $y = \sqrt{x + 4}$,
   (d) $y = -\sqrt{x - 4}$,

1. π and $\tan 30° = \frac{1}{\sqrt{3}}$ are irrational ✓✓

2. $(3\sqrt{6})^2 = 9 \times 6 = 54$ ✓

3. $\dfrac{6\sqrt{18}}{2\sqrt{2}} = 3\sqrt{9} = 9$ ✓✓

4. Let $x = 0.2\overset{..}{3}\overset{..}{7}$
    $1000x = 237.\overset{..}{3}\overset{..}{7}$
    $10x = 2.\overset{..}{3}\overset{..}{7}$
    $990x = 235$
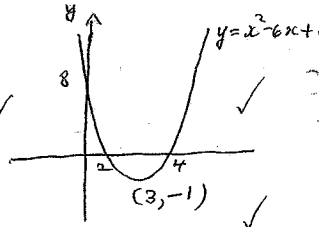 $x = \dfrac{235}{990} = \dfrac{47}{198}$ ✓✓✓

5. $\sqrt{54} + 2\sqrt{12} - \sqrt{24} - \sqrt{27}$
    $= \sqrt{9}\sqrt{6} + 2\sqrt{4}\sqrt{3} - \sqrt{4}\sqrt{6} - \sqrt{9}\sqrt{3}$
    $= 3\sqrt{6} + 4\sqrt{3} - 2\sqrt{6} - 3\sqrt{3}$ ✓✓
    $= \sqrt{6} + \sqrt{3}$

6. $(2\sqrt{3} + 4)^2 = c + d\sqrt{3}$
    $12 + 16\sqrt{3} + 16 = 28 + 16\sqrt{3} = c + d\sqrt{3}$ ✓
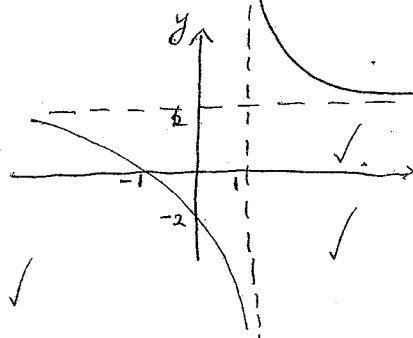 $c = 28$ and $d = 16$ ✓

7. $\dfrac{\sqrt{2}}{1-\sqrt{2}} - \dfrac{\sqrt{2}}{1+\sqrt{2}}$
    $= \dfrac{\sqrt{2} + \sqrt{4} - \sqrt{2}(1-\sqrt{2})}{1-2}$ ✓
    $= \dfrac{\sqrt{2} + 2 - \sqrt{2} + 2}{-1}$ ✓
    $= -4$ ✓

8. $\dfrac{2}{\sqrt{5}-1} \times \dfrac{\sqrt{5}+1}{\sqrt{5}+1}$ ✓
    $= \dfrac{2\sqrt{5}+2}{5-1}$
    $= \dfrac{2 + 2\sqrt{5}}{4}$ ✓
    $= \dfrac{1}{2} + \dfrac{1}{2}\sqrt{5}$
    $= \dfrac{1}{2} + \sqrt{\dfrac{5}{4}} = a + \sqrt{b}$
    So $a = \dfrac{1}{2}$, $b = \dfrac{5}{4}$ ✓

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9. (a)

    $y = 3x$ (1,3)   ✓✓

    (b) $2x + 3y = 6$
    When $x = 0$, $y = 2$
    $y = 0$, $x = 3$

    2   3 $2x+3y=6$ ✓✓

    (c) $(-2,9)$

    1    $y = 3^{-x}$ ✓✓

    (d)

    9    $y = 9 - x^2$ -3 3 ✓✓

    (e) $(x-3)^2 + y^2 = 9$

    $(3,0)$ ✓✓

    (f)

    $(2,2)$ $y = \dfrac{4}{x}$ ✓✓

10.

    3    $y = \sqrt{9 - x^2}$ ✓✓ -3 3

    $D : -3 \le x \le 3$ ✓
    $R : 0 \le y \le 3$ ✓
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11. $y = x^2 - 6x + 8$
    $y = (x-4)(x-2)$ ✓
    Roots where $x = 2, 4$
    Vertex where $x = 3$ ✓
    $y = 9 - 18 + 8$ ✓
    $= -1$

    $y = x^2 - 6x + 8$ 8 $(3,-1)$ ✓

    Y int where $x = 0$
    So $y = 8$.

12. $y = 2 + \dfrac{4}{x-1}$
    When $x = 0$, $y = 2 - 4$
    $= -2$ ✓
    when $y = 0$, $\dfrac{4}{x-1} = -2$ ✓
    $4 = -2x + 2$ ✓
    $x = -1$

    2   -1 -2 ✓ ✓

13. Let $y = \dfrac{x}{2x-1}$ ✓
    Swap x and y: $x = \dfrac{y}{2y-1}$
    $2xy - x = y$
    $2xy - y = x$ ✓
    $y(2x-1) = x$ ✓
    $y = \dfrac{x}{2x-1}$
    So $f^{-1}(x) = \dfrac{x}{2x-1}$ ✓
    $D :$ all $x \neq \dfrac{1}{2}$
    $R :$ all $y \neq \dfrac{1}{2}$ ✓
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14. (a)

    $(4,2)$ ✓✓

    (b)

    $(4,-2)$ ✓

    (c)

    2   ✓

    (d)

    4    $(8,-2)$ ✓

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