Loughborough University

Week 2: Formulae, Functions

Equations

Solutions

1. Given two functions $g(t) = 3t + 2$ and $h(t) = t + 3$ obtain an expression for (a) the composition $g(h(t))$, and (b) the composition $h(g(t))$, and (c) $g(g(t))$.

   Solution: (a) $g(h(t)) = 3t + 11$ (b) $h(g(t)) = 3t + 5$ (c) $g(g(t)) = 9t + 8$

2. Which of these are straight lines? State the gradient and y-intercept for the straight lines?

   Solution:

   (a) $2x + 3y = 4$ Yes; gradient$=-\frac{2}{3}$, intercept$=\frac{4}{3}$
   (b) $y = 3x^2 + 5$ No
   (c) $4xy + 2 = 5$ No
   (d) $x = 3$ Yes; gradient $=$ infinite (vertical line), no y-intercept
   (e) $x + y = 1.2$ Yes; gradient $= $ -1, intercept $= 1.2$
   (f) $x^2 - y^2 = 2$ No

3. What is the gradient of the straight line through (1,2) and (3,5)?

   Solution: $\frac{3}{2} = 1.5$

4. What is the equation of the straight line in question 3?

   Solution: $y = \frac{3}{2}x + \frac{1}{2}$

5. What is the distance between the points in question 3?

   Solution: $d = \sqrt{2^2 + 3^2} = \sqrt{13} = 3.61$

6. Solve

   (a) $4a^2 - 25 = 0$
      Solution: $a = 2.5, -2.5$
   (b) $12y^2 - 10 = 26y$
      Solution: $y = 5/2, -1/3$
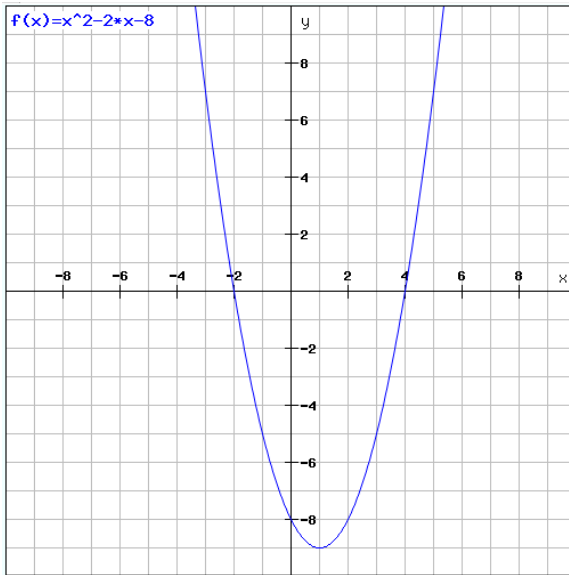   (c) $6a^2 - 15a = 0$
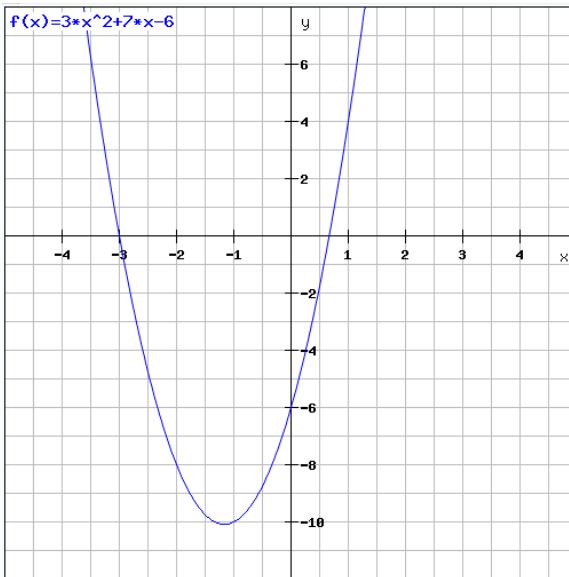   **Solution:** $a = 0, 5/2$
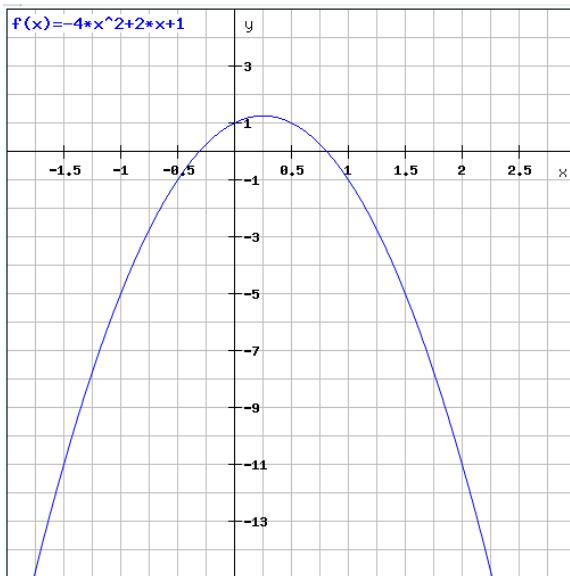
7. Sketch the curves

   Solution:

   (a) $y = x^2 - 2x - 8$

   (b) $y = 3x^2 + 7x - 6$

(c) $y = -4x^2 + 2x + 1$

f(x)=-4*x^2+2*x+1

8. Solve the simultaneous equations:

$$3x + 5y = 31 \quad (1)$$
$$\text{and} \quad 2x + 3y = 20 \quad (2)$$

Solution: $x = 7, y = 2$

9. Solve the simultaneous equations: $y = 2x + 3$ and $5x + 2y = -9$

Solution: $x = -1\frac{2}{3}, y = -\frac{1}{3}$