

1. **(A1.2 - E) (CI)** Write each expression as the logarithm of a single quantity: **(Cirrito 7.4, p221)**

a. $\log(6) + \log(x)$ b. $\log_3(M) + \log_3(N) - 2\log_3(P)$ c. $\log_b 12 - \frac{1}{2} \log_b(9)$

2. **(A1.2, F 2.6 - R) (CI)** For each pair of functions, state their domains and ranges and then determine the equation for $(f \circ g)(x)$ and also the equation for $(g \circ f)(x)$.
(Cirrito 2.4.2 p44; 5.3.3, p131; C5.3.4, p138)

a. $f(x) = \sqrt{x-1}$ and $g(x) = 1 + 2x^2$ b. $f(x) = e^x - 1$ and $g(x) = 2\ln(x+1)$

3. **(A1.2, F 2.6 - R) (CI)** Determine the equation(s) of the asymptotes as well as the x- and y-intercept(s) and then sketch the functions. State the transformations that have been applied to the “parent” function for each question. **(Cirrito 5.3.3, p131; Cirrito 5.3.4, p138)**

a. $y(x) = -\ln(x + 4)$ b. $y(x) = -e^{-x} + 2$

4. **(T3.5 - R) (CA)** The depth, d meters, of water in a harbour varies with the tides each day. The first high tide occurs at 05:00 am with a depth of 5.8 m. The first low tide occurs at 10:30 am with a depth of 2.6 meters. **(Cirrito 10.5, p361)**

- Find a trigonometric function that models, d , the depth of the water t hours after midnight.
- Find the depth of the water at 12 noon.
- A large boat needs at least 3.5 m of water to dock in the harbour. During what times after 12 noon can the boat dock safely?

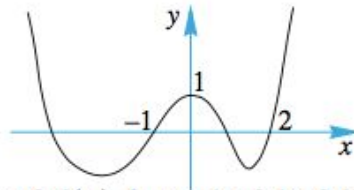
5. **(A1.2 - N, F2.7 - E) (CI)** Solve $\log_3(x - 2) + \log_3(x + 4) = 3$ for x . Use your TI-84 to graph and verify. Explain why there is only one solution for x . **(Cirrito 7.4, p221)**

6. **(A1.1, F2.3, F2.6 - R) (CI)** Given the function $f(x) = \ln(x - 3)$, determine **(Cirrito 5.3.4, p138)**

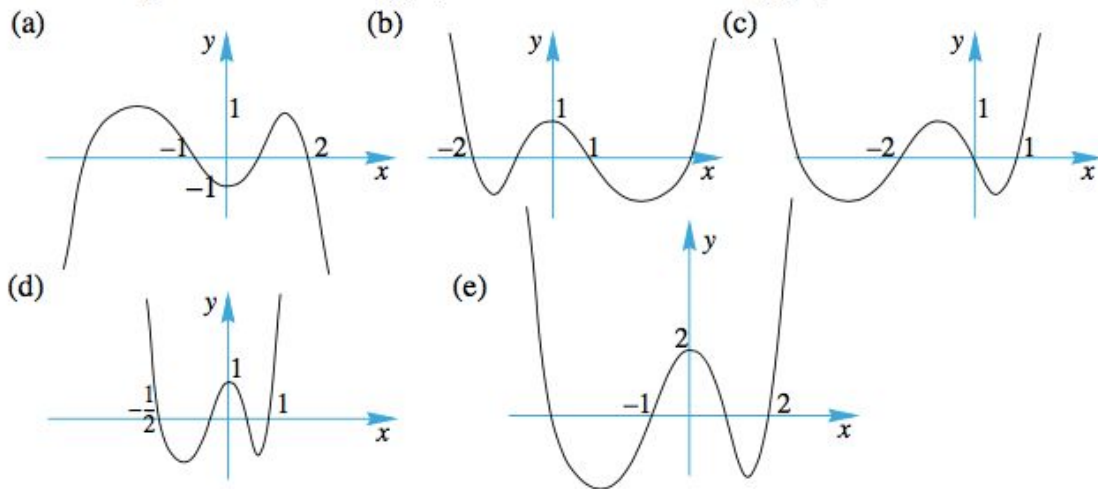
- the domain and range of f .
- the equation(s) of the asymptote(s) and intercept(s)
- a sketch of f .
- $h(x)$ represents a transformation of f . The equation for $h(x)$ is $h(x) = -2f\left(\frac{1}{2}x\right) + 5$. Determine the:
 - transformations applied to f .
 - the intercept(s) and asymptote(s) of h .
 - the equation for the inverse function of h .

7. (F2.3 - R) (CI) Transformation of functions ([Cirrito 6.1, p167](#); [Cirrito 6.2 p177](#); [Cirrito 6.3, p183](#))

The diagram shows the graph of the function $y = f(x)$.



Find the equation in terms of $f(x)$ for each of the following graphs.



8. (F2.1, F2.4, F2.7 - R) (CI) Given the quadratic function $Q(x) = 3(x - 1)^2 + 5$; ([Cirrito 2.4.1, p39](#); [Cirrito 2.4.2, p44](#))

- Determine the equation of the inverse function.
- Write the equation for $Q(x)$ in standard form.
- Given the standard form of the equation for $Q(x)$, find the value of the discriminant of $Q(x)$.
- Explain the graphical significance of the **sign of your discriminant**.
- The graphical significance you just noted about the sign of the discriminant of $Q(x)$ could have been determined from **the original function as presented** (as $Q(x)$). Explain how you could have made the same conclusion from the form.