

1. State the domain and range of the function $f(x) = \frac{1}{x+2}$.
2. State the domain and range of the function $g(t) = \frac{t}{t^2+1}$.
3. State the domain and range of the function $\arccos t$.
4. State the domain and range of the function $\arcsin t$.
5. State the domain and range of the function $\arctan t$.
6. Find the equation of the line that goes through the points $(2, 3)$ and $(-1, 5)$.
7. Find the equation of the line that goes through the points $(1, 1)$ and $(2, -2)$.
8. Suppose John puts a cup of coffee outside on a cold day. The temperature T of the coffee is a function of the time t that it has been outside. What do the x - and y -intercepts of the graph of this function represent?
9. The number of shoes that can be made is a function of the amount of material available and is given by the function $S(q) = S$. What does the inverse of this function represent?
10. What rule do we use to test if a graph represents a function?
11. What rule do we use to test if a function has an inverse by simply looking at its graph?
12. What is the inverse of the function $Q(t) = Q_0(1 + e^{kt})$?
13. Consider the function given by $f(x) = 3x^3$.
 - (a) What is the equation of the function whose graph is that of $f(x)$ shifted to the right π units?
 - (b) What is the equation of the function whose graph is that of $f(x)$ shifted to the left π units and up e units?
 - (c) What do you have to do to the graph of $f(x)$ to get the graph of the function $g(x) = 3(x - \pi^e)^3 + e^\pi$?
14. Find the roots of the following functions:
 - (a) $x^2 + 3x - 10$
 - (b) $(x - 3)^2 - (x - 3) + 4$
 - (c) $(x + \pi)^2 + 2(x + \pi) + 4 + e$
15. Kerry fills a vat with sand. At time $t = 0$, she opens a valve, and the sand starts to run out of the vat. Suppose that the amount of sand in the vat after t seconds is given by the equation

$$S(t) = S_0 e^{kt},$$

where S_0 is the amount of sand in the vat at time $t = 0$. Also suppose that after 7 seconds, 10% of the sand has run out of the vat.

- (a) How much sand is in the vat after t seconds?
- (b) What percent of the original amount of sand is left after 15 seconds?
- (c) What does the inverse function represent?

(d) What is the inverse function?

(e) How long will it take before all the sand is gone?

16. What is the amplitude and period of the function $3 \cos(\frac{\pi}{2}t + 337)$?

17. When is $\arcsin(\sin t) = t$?

18. When is $\tan(\arctan t) = t$?

19. Graph the following functions:

(a) $f(x) = 5 \sin(4x)$

(b) $g(x) = 3x + -1$

(c) $h(x) = (x - 2)^2 + 4$

20. Verify the following identities:

(a) $\frac{\sin x}{1 - \cos x} = \frac{1 + \cos x}{\sin x}$

(b) $(\cos t + \sin t)^2 = 1 + 2 \sin t \cos t$

(c) $\frac{\csc u}{\cot u} - \frac{\cot u}{\csc u} = \tan u \sin u$