1. Suppose the average surface temperature of the earth is modeled by the linear function

$$T = 0.02t + 8.50$$

where T is temperature in C° and t represents years since 1900.

(a) What units do the slope and the T-intecept have?

slope: °C/year T-intercept: °C

(b) What do the slope and T-intercept represent in physical terms?

slope: rate of temperature increase

T-intercept: temperature in 1900

(c) Use the equation to predict the average global surface temperature in 2100.

$T = 0.02(200) + 8.5 = 12.5\,°C$

2. Find an equation of a line that has slope -2 and passes through the point $(3, -5)$. Write the equation of the line in point-slope form **and** then again in y-intercept form.

$y - (-5) = -2(x-3)$

$y = 5 - 2(x-3)$ (point-slope form)

$y = -2x + 11$ (y-intercept form)

3. Rewrite the formula for temperature in Problem 1 in point slope form where the point is determined by the the temperature in the year 2000.

Temp at $t = 100$ (year 2000): $0.02(100) + 8.5 = 10.5$

$T = 10.5 + 0.02(t - 100)$

Quadratic Functions

4. A ball is dropped from the upper observation deck of the CN Tower 450 m above the ground. The height above the ground h after t seconds is given by the equation $h(t) = -4.9t^2 + 0.96t + 449.36$.

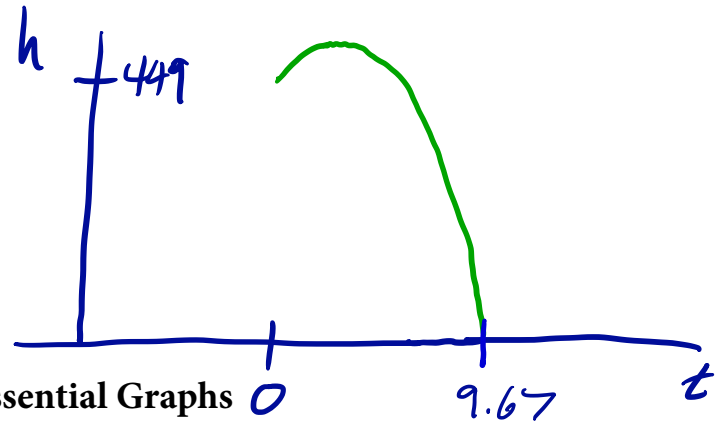
(a) When does the ball hit the ground?

$h(t) = 0$: $t = \dfrac{-0.96 \pm \sqrt{(0.96)^2 + 4(4.9)\cdot 449.36}}{2\cdot(-4.9)}$

$= -9.47\ldots,\ 9.67\ldots$

Hits ground at $t \approx 9.67$ seconds

(b) Sketch a rough picture of the graph $h(t)$. Given the physical understanding of the problem, what would be a reasonable domain for the function $h(t)$?

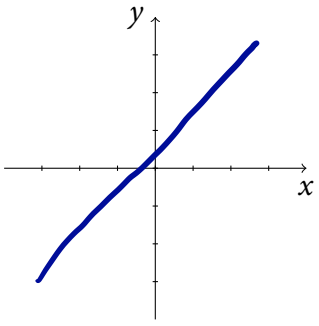


Essential Graphs

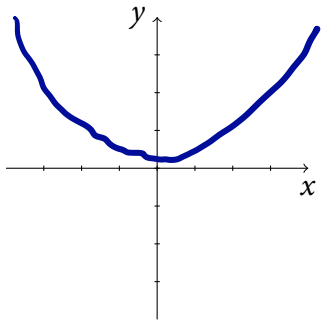
Set your graphing calculator and your computer aside. You should know the graphs the following functions in this section by heart. In your sketches, clearly indicate any asymptotes, or other interesting behavior.

5. Sketch the graphs of the following functions:

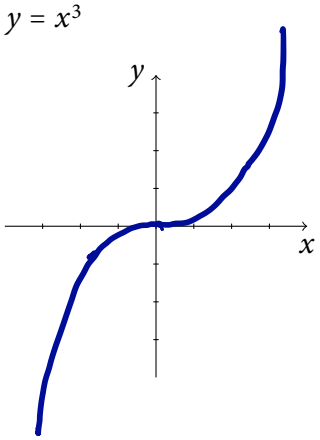
(a) $y = x$



(b) $y = x^2$

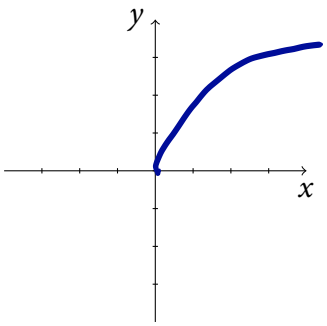


(c) $y = x^3$

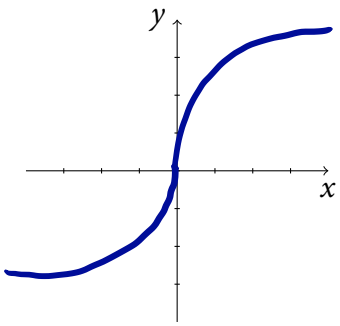


6. Sketch the graphs of the following functions:

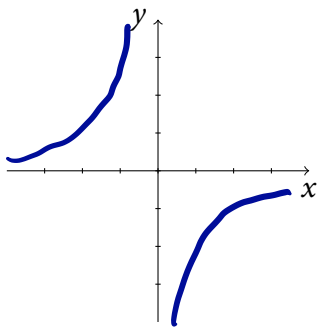
(a) $y = \sqrt{x}$



(b) $y = \sqrt[3]{x}$

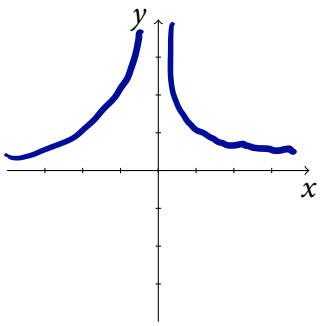


(c) $y = \dfrac{1}{x}$

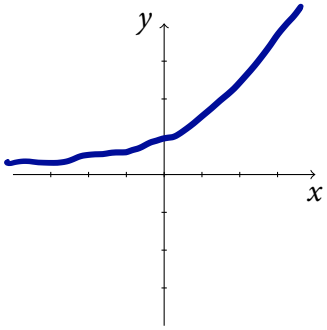


7. Sketch the graphs of the following functions:

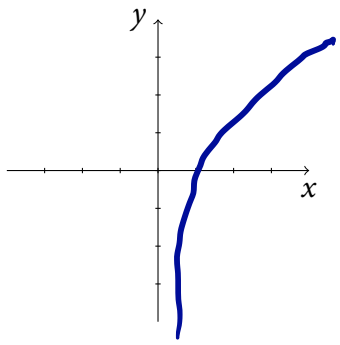
(a) $y = \dfrac{1}{x^2}$



(b) $y = e^x$

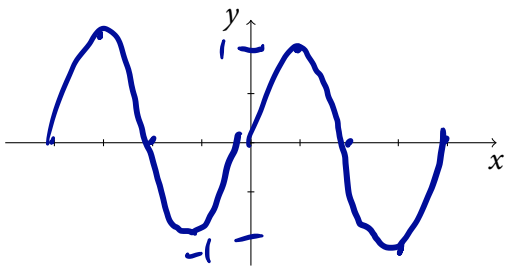


(c) $y = \ln x$

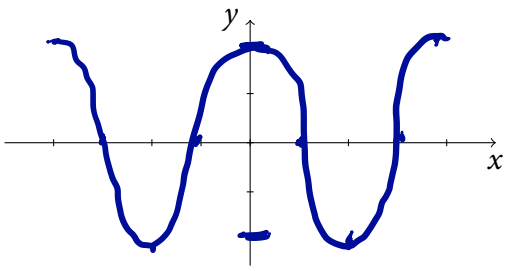


8. Sketch the following functions on $[-2\pi, 2\pi]$

(a) $y = \sin x$



(b) $y = \cos x$

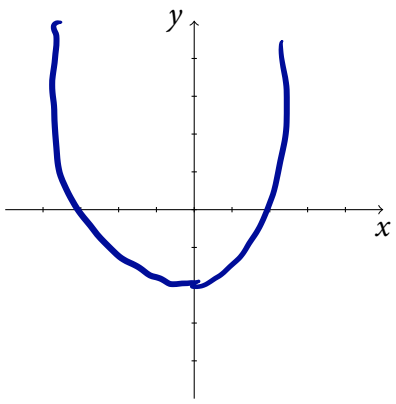


Graphs of Functions Related by Transformations

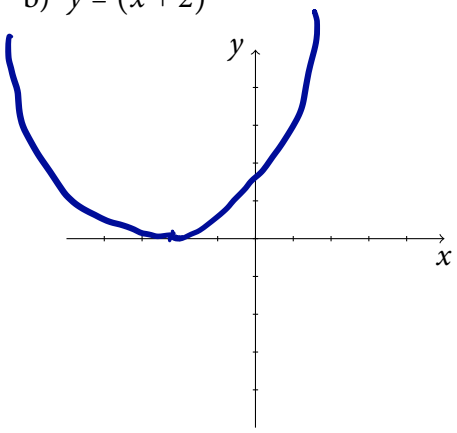
Once you know the graph of one function, it's easy to sketch the graphs of other functions that related to it by certain simple transformations. Again, set your technology aside and make these sketches the old-fashioned way.

9. Translations. Graph the following functions.

a) $y = x^2 - 2$

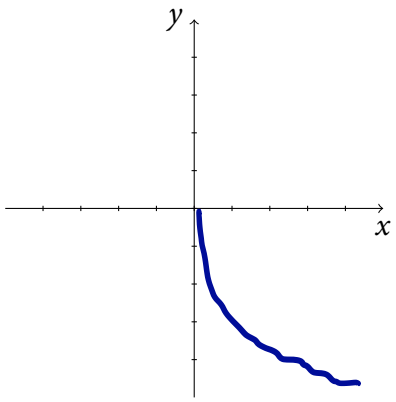


b) $y = (x + 2)^2$

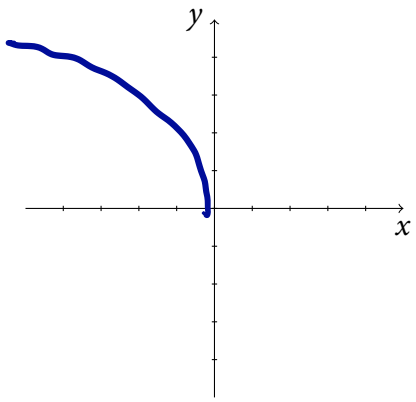


10. Refections. Sketch the graphs of the following functions.

a) $y = -\sqrt{x}$

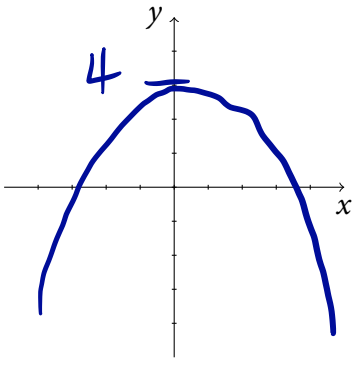


b) $y = \sqrt{-x}$

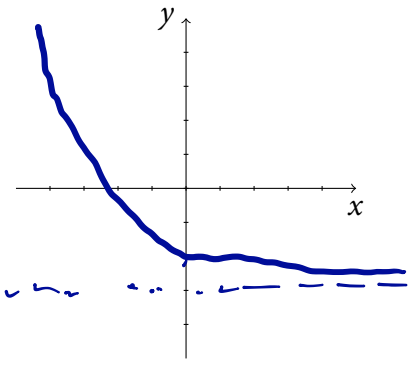


11. Graph the following functions.

(a) $f(x) = 4 - x^2$



(b) $f(x) = e^{-x} - 3$



(c) $f(x) = \ln(x + 3) + 1$