

1. 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.

$$m = -2$$

$$P(3, -5)$$

y-intercept form:

$$y = mx + b$$

$$-5 = -2 \cdot 3 + b$$

$$b = 1$$

$$\underline{y = -2x + 1}$$

p.-s. form:

$$m = \frac{y - y_1}{x - x_1}$$

$$-2 = \frac{y + 5}{x - 3}$$

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

$$\underline{y = -2x + 1}$$

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

$$T = 0.02t + 8.50$$

where T is temperature in $^{\circ}\text{C}$ and t represents years since 1900.

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

$$m = \frac{\Delta T}{\Delta t} \text{ } ^{\circ}\text{C}/\text{years}$$

T -intercept (years)

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

- slope is the rate of change of T with respect to t
- initial value of the temperature, $T(1900)$

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

$$2100 - 1900 = 200. \text{ We want } T(200) = 0.02 \cdot 200 + 8.5 = 12.5^{\circ}\text{C}$$

- (d) Rewrite the formula for temperature above in point-slope form where the point is determined by the the temperature in the year 2100.

$$0.02 = \frac{T - T(200)}{t - 200}$$

$$T(t) = 0.02(t - 200) + 12.5$$

Quadratic Functions

3. 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 $h(t) = -4.9t^2 + 0.96t + 449.36$.

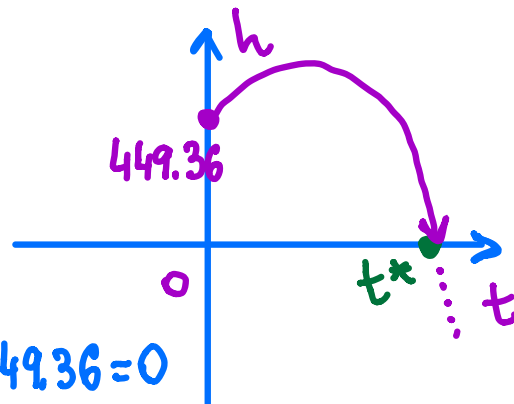
- (a) When does the ball hit the ground?

at t^* the ball hits
the ground

$$\text{at } t^*: h(t^*) = 0$$

$$h(t) = 0 \Rightarrow -4.9t^2 + 0.96t + 449.36 = 0$$

$$t^* \approx 9.67 \text{ (s)} \quad t \text{ can take only values } \geq 0$$



- (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 $h(t)$?

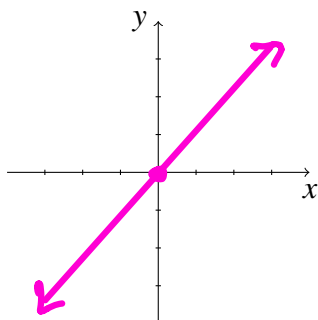
$$\text{Dom}(h) = [0, 9.67]$$

Essential Graphs

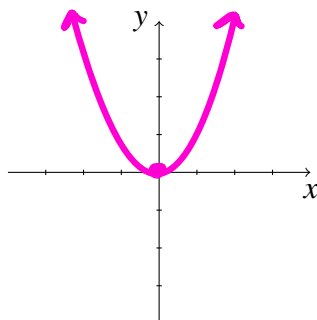
Set your calculator/computer aside. You should know the graphs the following functions in this section by heart. In your sketches, clearly indicate any asymptotes and intercepts.

4. Sketch the graphs of the following functions:

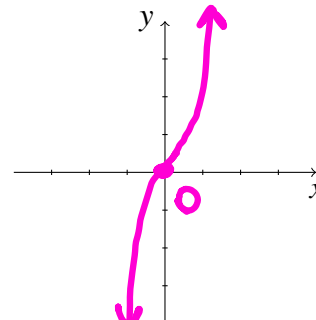
(a) $y = x$



(b) $y = x^2$

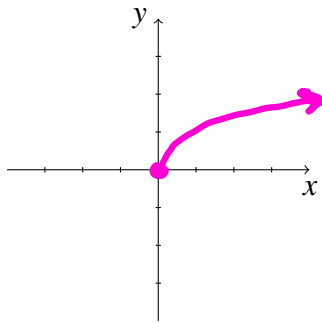


(c) $y = x^3$

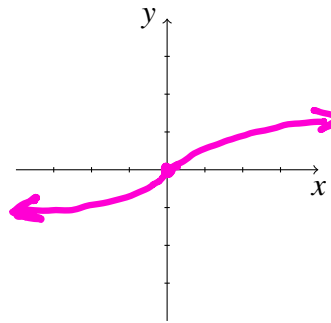


5. Sketch the graphs of the following functions:

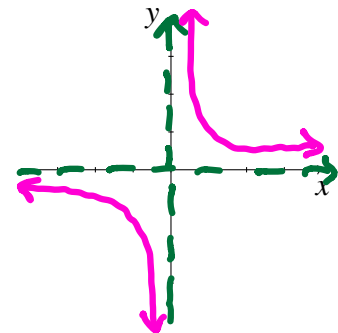
(a) $y = \sqrt{x}$



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

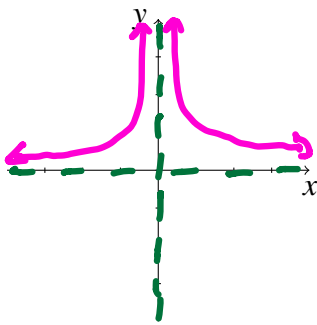


(c) $y = \frac{1}{x}$

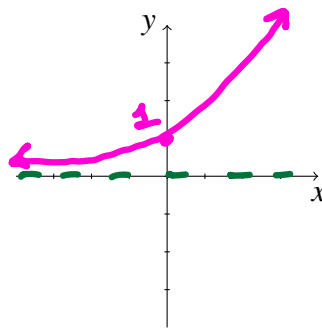


6. Sketch the graphs of the following functions:

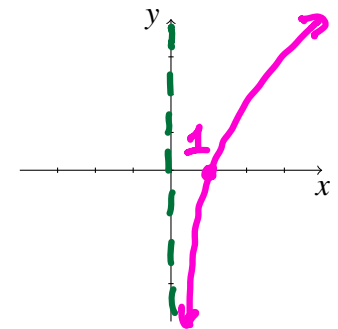
(a) $y = \frac{1}{x^2}$



(b) $y = e^x$

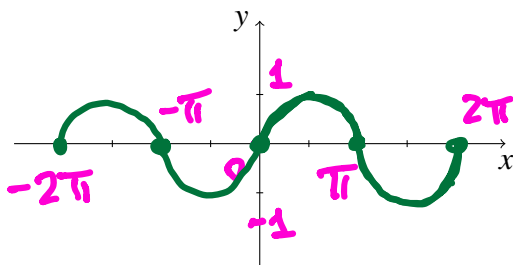


(c) $y = \ln x$

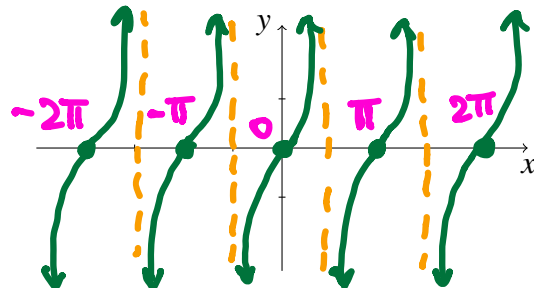


7. Sketch the following functions on $[-2\pi, 2\pi]$

(a) $y = \sin x$



(c) $y = \tan x$



(b) $y = \cos x$

