TMath 120

1. [4] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

   T   F $\dfrac{1}{a^2} + \dfrac{1}{a} = \dfrac{2}{a^2}$

   T   F $\log(a + b) = \log(a) + \log(b)$ for positive a and b.
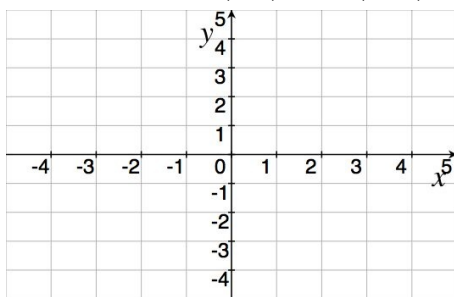
   T   F   The equation $x^2 + (y - 2)^2 = 9$ defines a circle centered at $(0, -2)$

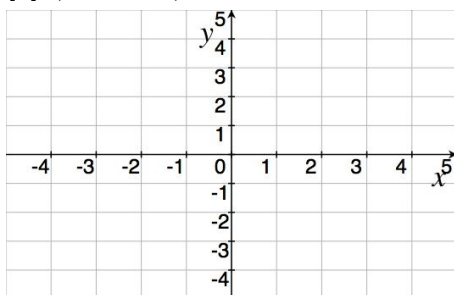   T   F   The distance between $(-2, 5)$ and $(2, 2)$ is 5 units.

   Show all your work. Reasonable supporting work must be shown to earn credit.

2. Provide a graph AND an algebraic rule/expression for each of the functions described:

   (a) [4] (WebHW7#7) An exponential function that has been vertically stretched and passes through (0,3) and (1, 6).

   (b) [4] (§3.2#56) A logarithm function with a domain of $(-2, \infty)$.

3. The number of people in a community who became infected during an epidemic x weeks after its outbreak is modeled by the function
$$f(x) = \frac{25,000}{1 + ae^{kx}}$$
for some parameters a and k. This is graphed to the right.
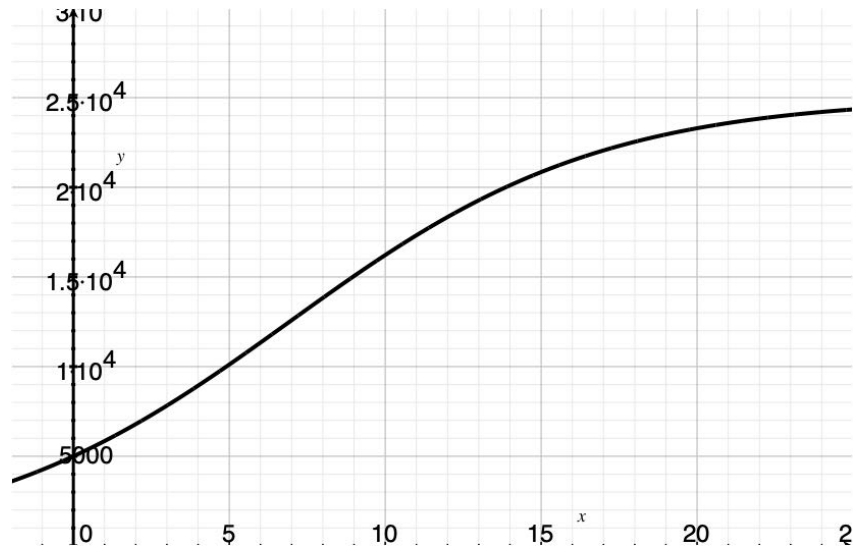
(a) [2] (Quiz3#1) Find a realistic range for f.

(b) Estimate the following *if* possible:

   i. [2] (§3.1 #84) $f(15)$

   ii. [1] (Quiz3#1) The y intercept of f.

   iii. [2] (LogActivity#4) All possible x such that $f(x) = 10,000$.

   iv. [2] (WebHW9#1) The eventual number of infected people as $x \to \infty$.

(c) [6] (WebHW8#32) Find the parameters a and k so we have the complete algebraic rule of f.

4. [3] (WebHW9#2) How much should a guardian invest at the time their son's birth in order to afford (one year of) $14,000 tuition at the University of Washington in 18 years? Assume 5% compounded monthly.

5. [4] (LogInPractice#2) How long will it take to take for $2,500 to amount to $14,000 if invested at an annual rate of 5% compounded continuously?

6. Assume that $\log_2(a) = 5$ and $\log_2(ab) = 7$.

   (a) [2] (§3.2 #28) Find a.

   (b) [2] (§3.3 #16) Find $\log_2(b)$.

7. [2] (§4.1 #40) Convert $\frac{-3\pi}{4}$ radians into degrees.

8. [2] (CircleActivity#7) Sketch/draw the angle $\frac{-3\pi}{4}$.

9. [3] (PracticeExam) Simplify

$$\left(\frac{3x}{2\sqrt{y}}\right)\left(\frac{x}{4}\right)^{-2}$$

10. (§3.5 #52) Let I be the intensity of an earthquake X and S be the intensity of a 'standard' earthquake of 10^{-4} cm on a seismograph. Then the measurement of an earthquake X as measured on the Richter scale is:

$$\log\left(\frac{I}{S}\right)$$

   (a) [2] New standards were put into place for King County in 2018 which were designed so that buildings have a low chance of collapse (10%) if caught in an earthquake with a Richter scale of 8.9 or less. Find the intensity of the earthquake that would increase the chance of this building's collapse.

   (b) [3] February 6th 2023 Turkey had massive earthquake that measured 7.5 on the Richter scale. February of 2001 Tacoma had an earthquake measuring 6.8 on the Richter scale. How many more times intense was Turkey's earthquake than the one in Tacoma?