Exam 2 # TMath 120 Spring 2020

NAME:
Show all your work. You are welcome to use a calculator but no notes, books, internet resources (Desmos is the exception!) or peers can be used. Reasonable supporting work must be shown to earn credit.

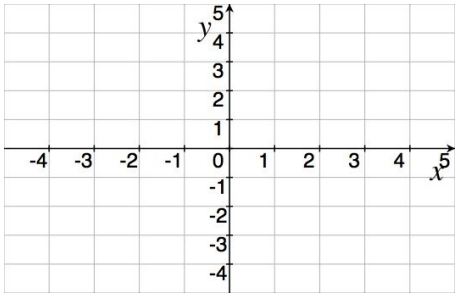
1. Sketch the angles with the measures given below

   (a) [2] $-30°$

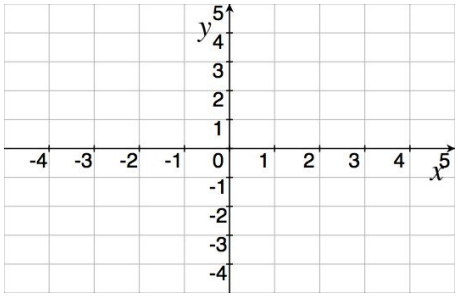
   (b) [2] $\frac{5\pi}{4}$ radians

2. Provide a graph AND an algebraic rule/expression that which is described:

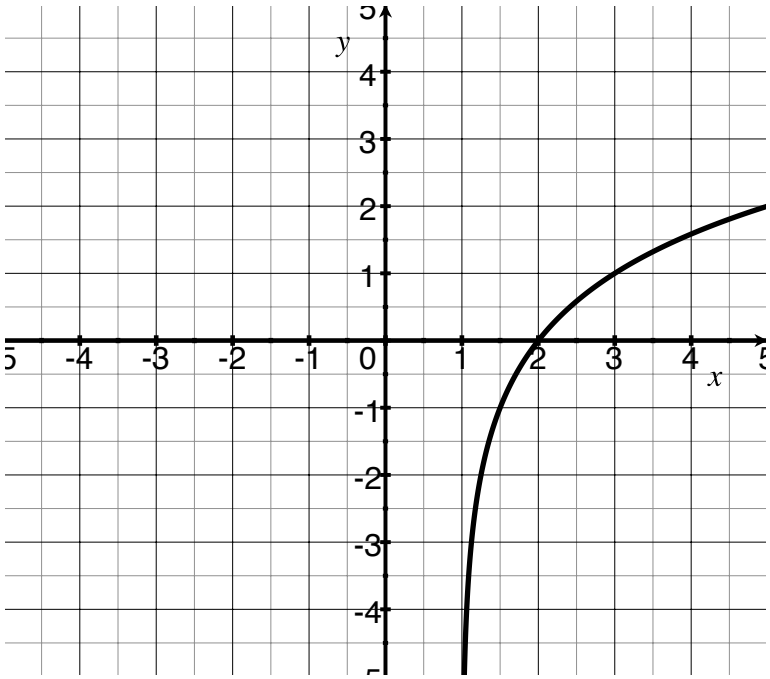
   (a) [3] A exponential function whose range (outputs) is $(-2, \infty)$.



   (b) [3] A circle with radius 2 and centered at $(0, 2)$



3. Let f be a logarithm function (whose base is unknown!!!) that has been horizontally shifted & graphed below.



(a) Estimate the following *if* possible:

i. [1] $f(0)$

ii. [2] the domain of f

iii. [1] all a so that $f(a) = 1$.

iv. [1] the x-intercept(s)

(b) [2] Does f have an inverse? Why or why not?

(c) [2] We know from above that the graph of f is shifted horizontally. Describe precisely how much and in what direction $f(x)$ can be obtained from the graph of a basic logarithmic function (whose base is unknown!!!).

(d) [3] Find the algebraic rule for the function f.

4. The temperature T (in C°) of coffee at time t minutes after its removal from the microwave is given by the equation $T = 25 + 73e^{-0.28t}$.

   (a) [2] Find the temperature when after a half hour has passed.

   (b) [3] When will the temperature reach 30°C?

5. Let x and y be defined so that $\ln(x) = 2$ and $\ln(y) = 5$. Compute the following:

   (a) [1]
   $$\ln(x)$$

   (b) [1]
   $$(\ln(x))(\ln(y))$$

   (c) [2]
   $$\ln(xy)$$

   (d) [2]
   $$x$$

6. Entropy S is a function of the number of possible states W, that are accessible to a system with a given amount of energy. We can explicitly compute entropy by

$$S = k \ln(W)$$

where k is Boltzmann's constant which is approximately $1.38065 \cdot 10^{-23} \mathrm{m}^2 \mathrm{kg\ s}^{-2} \mathrm{K}^{-1}$.

(a) [3] If a gas has entropy 2, about how many possible states does the gas have?

(b) [4] If liquid A has 1,000,000,000,000 (so $1 \cdot 10^{12}$) times more possible states than liquid B, which liquid has a higher entropy and what is the difference?