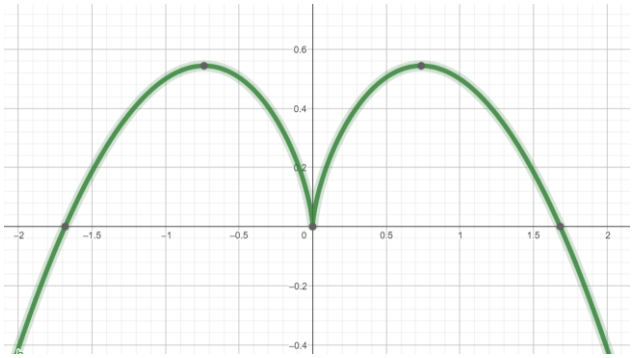
6/10/24 Name _____ APID _____

US24 MTH 124 Activity 4 (4.1/4.2/4.3/4.4/4.5/5.1/5.3) (ALL WORK REQUIRED)

Note: (1) If you think the answer doesn't exist, just demonstrate your work and write "DNE" or "doesn't exist".

(2) Each question is worth 5 points. And the final score will be rescaled to the total 20 points and then rounded to 2 decimal place.

1) (20points) The graph of the funciton $f(x)=x^{\frac{2}{3}}-\frac{x^2}{2}$ is given below. Follow the following steps to find out the extrema of the function over the interval [-1, 2) .



[i] What are the singular points of $f(x)$?

[ii] What are the stationary points of $f(x)$?

[iii] What are the endpoints of $f(x)$ over this interval [-1, 2)?

[iv] Find all extrema of the function f and determine they are relatively/absolutely minimum/maximum.

2) (15points) Compute $f'(x)$ for the following function.

[i] $f(x)=\dfrac{x^2-2}{x+1}$

[ii] $f(x)=e^{-|x|}$

[iii] $f(x)=\ln\left((x+1)^2(x-1)\right)$

3) (10points) A perfect round balloon is deflecting. And its radius is decreasing in a rate of 4 units per second when the radius is 10 units. What is the decreasing rate of the volume of the balloon?

How about the decreasing rate of the surface area of the balloon?

4) (10points) **Rounded the answers in this problem to 1 decimal places.**

On a road, the position of a car is described by the following equation:

$$P(t) = 6(t-1)^3 + 6t + 6, \quad 0 \le t \le 3$$

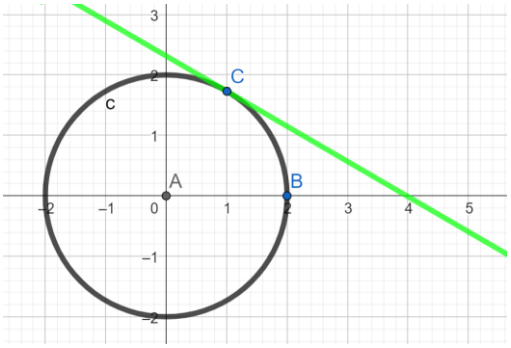
Where the unit of t is hour and the unit of P is mile.

[i] Does this car go over the speed limit? Assume the speed limit is 60 mile/hr.

[ii] When does this car have no acceleration?

5) (15points) Given a circle centered at the origin with radius 2. There is a point $C\left(1, \sqrt{3}\right)$ on the circle. Follow the following steps to find the equation of the tangent of C to the circle

[i] Formulate the y coordinate of the upper circle as a funciton of the x coordinate.



[ii]What's the slope of the tangent line at C?

[iii] What's the equation of the tangent line at C?