Math 1B Midterm 2 Non-Volume Review

- [1] Find the area of the region between $y = 4 x^2$ and $y = x^2 2x$ on [0, 4].
- [2] Find the value of c guaranteed by the Integral Mean Value Theorem for $f(x) = x^2 + 2x$ on the interval [0, 3].

[3] Find the length of the curve
$$y = \frac{1}{8}x^4 + \frac{1}{4x^2}$$
 on [1, 2]

[4] Find the length of the curve
$$y = \int_{2}^{x} \sqrt{t^2 - 2t} dt$$
 on [2, 5].

[5] Find the length of the parametric curve
$$\begin{aligned} x &= \frac{9}{4}t^4 - 2t^2 + 5 \\ y &= 4t^3 - 2 \end{aligned}$$
 over $1 \le t \le 2$.

[6] A continuous random variable X with mean value 5.4 has probability density function $f(x) = \begin{cases} kx^n, & 0 \le x \le 9\\ 0, & x < 0 & or & x > 9 \end{cases}$

for some constants k and n.

- [a] Find k and n.
- [b] Find c such that the probability that X is less than c or greater than c are the same. (This is called the median value of X.)
- [7] A 20 foot chain hangs off the edge of a 50 foot building. The density of the chain x feet from its bottom end is given by $\delta(x) = 1 + x$ pounds per foot. Find the work done in pulling the chain to the top of the building.

[8] A solid of revolution has volume $\int_{0}^{\pi} 2\pi (y+1)(1-\cos y) \, dy$. Find the region and the axis of revolution.

- [9] A solid of revolution has volume $\int_{1}^{4} \pi ((3+x)^2 (3-\sqrt{x})^2) dx$. Find the region and the axis of revolution.
- [10] Find the centroid of the region bounded by $y = 4x x^2$ and y = x 4.

Use fnInt for all questions below (use 62.4 lb/ft³ for the weight density of water)

- [11] A spherical tank of radius 4 feet containing water is buried underground, so that its center is 8 feet below ground level.
 - [a] Find the work done in pumping the water to ground level
 - [i] if the tank is full.
 - [ii] if the tank is half full.
 - [b] Find the work done in pumping the top half of the water to ground level if the tank is full.