Fall 2016 Math 2B - Midterm I

Name :

Student ID # :

Seat :

I certify that this exam was taken by the person named and done without any form of assistance including books, notes, calculators and other people.
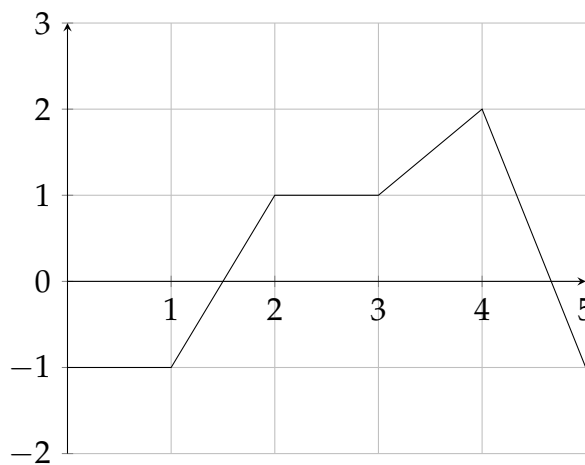
Signature :

1		2	
3		4	
5		6	
Total			

- *This exam consists of 6 problems.*

- *Read directions for each problem carefully.*

- *Please show all work needed to arrive at your solutions.*

- *Justify all your answers.*

Problem 1 :

1) Below is the graph of the function f. Let $g(x) = \int_0^x f(t)\, dt$ for all x in $[0,5]$.

(a) On which interval is g decreasing? Justify your answer. **[3 pts.]**

(b) Where does g reach its minimum on the interval $[0,5]$? Give the value of g at this point. **[2 pts.]**

2) Evaluate the following $\dfrac{d}{dx}\left(\displaystyle\int_{\frac{1}{x}}^{2x}\cos(t^2)\,dt\right).$ **[5 pts.]**

Problem 2 : (a) Use the midpoint rule with 3 equal subintervals to approximate

$$\int_1^7 \frac{x^2}{4} + 1\,dx.$$

[5 pts.]

(b) Express the previous integral as a limit of a Riemann sum. Do not evaluate the sum. **[5 pts.]**

Problem 3 : Evaluate the following integrals.

(a) $\int_0^1 \frac{x}{x^2 - 2} \, dx.$ **[5 pts.]**

(b) $\int \frac{\sqrt{\tan x + 1}}{\cos^2 x} \, dx.$ **[5 pts.]**

Problem 4 : Find the average value of the function $f(x) = e^{3x+1}$ on $[0, \frac{1}{3}]$.   **[5 pts.]**

Problem 5 : A particle moves along a line and has velocity $v(t) = 2\cos t - 1$, for all $t \geq 0$. Evaluate the total distance traveled by the particle between the times $t = 0$ and $t = \dfrac{\pi}{2}$, that is $\displaystyle\int_0^{\frac{\pi}{2}} |v(t)|\, dt$.   **[5 pts.]**

Problem 6 : Let $\mathcal{S}$ be the region bounded by the curve $y = \sqrt{2x}$ and the line $y = x$.

1) Compute the area of $\mathcal{S}$. **[6 pts.]**

2) (a) Find the volume of the solid obtained by revolving $\mathcal{S}$ about the x-axis. **[6 pts.]**

(b) Set up an integral to find the volume of the solid obtained by revolving $\mathcal{S}$ about the line $x = 3$. (You do not need to evaluate it.) **[5 pts.]**