Math 126
Summer 2014
Dr. Lily Yen

Test 1

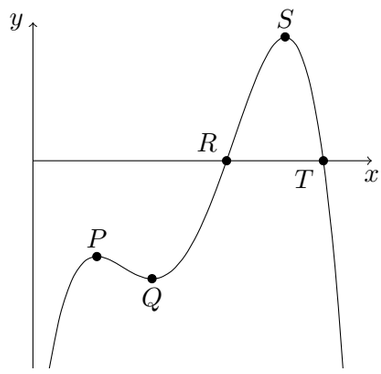
Show all your work

Name: _____

Score: ___/46

No Calculator permitted in this part. Read the questions carefully. Show all your work and clearly indicate your final answer. Use proper notation.

Problem 1: Let $A(x) = \int_0^x f(t)\,dt$, where f is the function graphed below.



a. $A(x)$ has a local maximum at the x-coordinates of (circle all that apply):

$$P \qquad Q \qquad R \qquad S \qquad T$$

b. $A(x)$ has a local minimum at the x-coordinates of (circle all that apply):

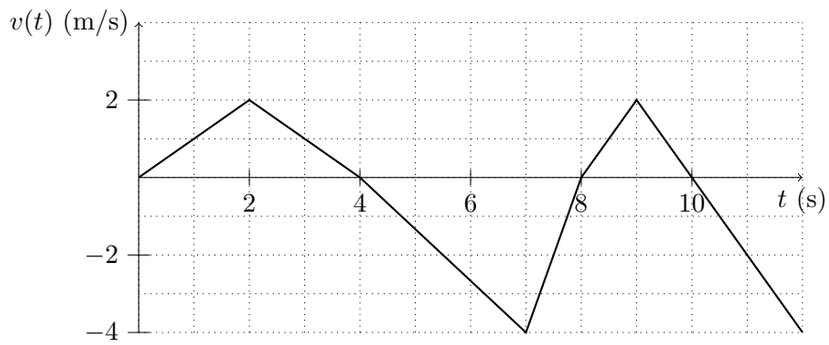
$$P \qquad Q \qquad R \qquad S \qquad T$$

c. Which inequality is true for all x in the interval over which the graph of f is shown? (Circle all that apply.)

$$A(x) \leq 0 \qquad A(x) \geq 0 \qquad \text{neither} \qquad \text{both}$$

Score: /3

Problem 2: A particle begins at the origin at time $t = 0$ and moves with velocity $v(t)$ as shown below.



a. Find the distance travelled by the particle after 7 seconds?

b. How many times does the particle return to the origin in the first 12 seconds?

c. Find the largest time interval when the particle is moving towards the origin.

d. What is the particle's maximum distance from the origin?

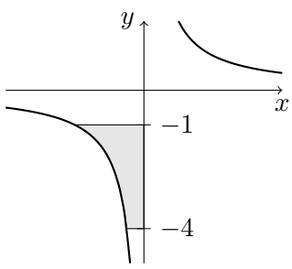
e. Directly on the graph, draw in and shade the approximating rectangles representing L_6.

Score: /7

Problem 3: Evaluate exactly $\displaystyle\int_{-1}^{2} |(x-1)(x+2)|\,dx$

Score: /4

Problem 4: Determine the exact area of the shaded region bounded by the y-axis, the curve given by $x = \frac{1}{y}$, and the lines $y = -1$ and $y = -4$.



Score: /2

Problem 5: Integrate the following analytically.

a. $\displaystyle\int 3u\sqrt{4+u}\,du$

Score: /3

b. $\displaystyle\int_{\pi/2}^{\pi} \sin\left(\frac{5x-\pi}{6}\right)\,dx$

Score: /3

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Calculators permitted from here on.

Problem 6: Express the following limit as an integral and evaluate.

$$\lim_{N\to\infty} \frac{\pi}{6N} \sum_{j=1}^{N} \sin\left(\frac{\pi}{3} + \frac{\pi j}{6N}\right)$$

Sketch and shade the corresponding region whose area the limit represents. Compute the integral exactly.

Score: /3

Problem 7: Evaluate the following integrals exactly using the Fundamental Theorem of Calculus.

a. $\dfrac{d}{dx}\displaystyle\int_2^x \sqrt{t^5 - 1}\, dt$

Score: /1

b. $\displaystyle\int \frac{d}{dt} \sin(e^t)\, dt$

Score: /1

c. $\dfrac{d}{dt}\displaystyle\int_{e^t}^{t^4} u^3 + \cos(u^2)\, du$

Score: /3

Problem 8: Evaluate the following integral exactly.

$$\int_1^{\sqrt{3}} \frac{dx}{\tan^{-1}(x)(1+x^2)}$$

Score: /3

Problem 9: Evaluate the following integral analytically.

$$\int_0^{3/4} \frac{dx}{\sqrt{9-16x^2}}$$

Score: /3

Problem 10: On a hot summer day, Burnaby consumes water at the rate of

$$r(t) = 100 + 72t - 3t^2$$

(in millions of litres per hour), where t is the number of hours past midnight. Answer the following by writing logical and coherent steps which lead to your final answer. No mark will be given to a single number answer.

a. When is water consumed at the highest rate?

Score: /1

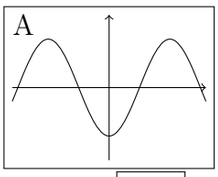
b. Find the daily water consumption.

Score: /2

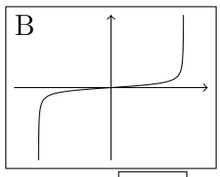
c. How much water is consumed between 6 pm and midnight?

Score: /2

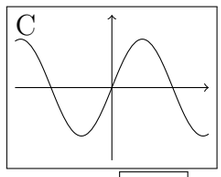
Problem 11: Match each graph of $y = f'(x)$ (A–E) with the graph of a possible anti-derivative, $y = f(x)$ (1–10).



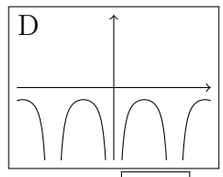
Answer: ☐



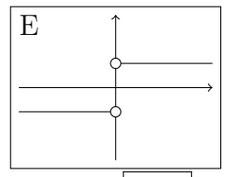
Answer: ☐



Answer: ☐

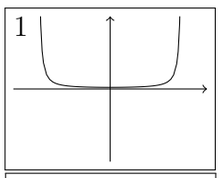


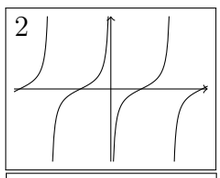
Answer: ☐

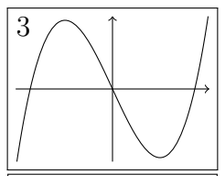


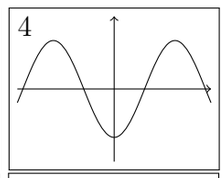
Answer: ☐

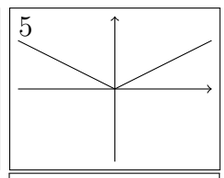
Anti-derivative graphs:

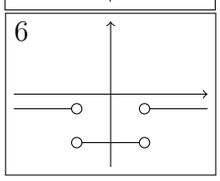


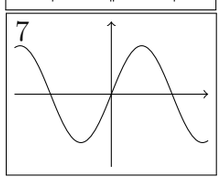


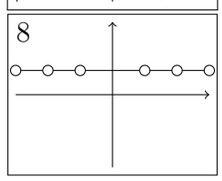


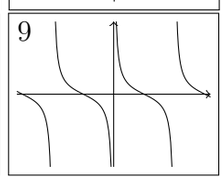


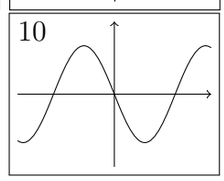












Score: /5