Name: _____

Math 181-Quest 4 Dr. Rebin Muhammad M: _____

Do not use any unapproved aids while taking this assessment. Read each question carefully and be sure to show all work in the space provided.

1. Determine whether the statement is true or false.

   (a) If f and g are continuous on $[a, b]$, then

   $$\int_a^b [f(x) - g(x)]dx = \int_a^b f(x)dx + \int_b^a g(x)dx$$

   (b) If f and g are continuous on $[a, b]$, then

   $$\int_a^b \frac{f(x)}{g(x)}dx = \frac{\int_a^b f(x)dx}{\int_a^b g(x)dx}$$

   (c) If f is continuous on $[a, b]$, then

   $$\int_a^b xf(x)dx = x\int_a^b f(x)dx$$

   (d) if f' is continuous on $[1, 3]$, then $\int_3^1 f'(v)dv = -f(3) + f(1)$

   (e) $\int_{-5}^5 ax^3dx = 2a\int_0^5 x^3dx$

   (f) All antiderivative function have derivative.

   (g) All continuous function have derivative.

   (h) $\int_0^2 \left(x - x^3\right) dx$ represents the area under the curve $y = x - x^3$ from 0 to 2.

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2. You've been asked to design a metalic box that is constructed from a rectangular sheet of metal of size 312×312 centimeters^2. Four equally sized squares must be cut from each corner of the rectangle, so that the remaining material can be folded and welded into a lidless box. How large should these squares be to maximize the volume that this box can contain?

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3. Explain how to compute the exact value of each of the following definite integrals using the Fundamental Theorem of Calculus. Leave all answers in exact form, with no decimal approximations.

(a)
$$\int_3^4 (-11\,e^x)\,dx$$

(b)
$$\int_{-1}^3 \left(-4\,x^3 - 2\,x^2 + 6\,x\right)\,dx$$

(c)
$$\int_{\frac{1}{6}\,\pi}^{\frac{1}{4}\,\pi} (-6\,\sin(x))\,dx$$

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4. Answer the following questions concerning $f(x) = 6\,x^2 - 72\,x + 120$.

   (a) What is the total area between $f(x) = 6\,x^2 - 72\,x + 120$ and the x-axis from $x = 1$ to $x = 7$?

   (b) What is the net area between $f(x) = 6\,x^2 - 72\,x + 120$ and the x-axis from $x = 1$ to $x = 7$?

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5. Write the definite integral equivalent to the limit.

$$\lim_{n\to\infty}\sum_{i=1}^{n}\left[\left(1+\frac{i}{n}\right)^2+1\right]\cdot\frac{1}{n}$$

6. The graph of f is shown in the figure. Evaluate each definite integral by interpreting it in

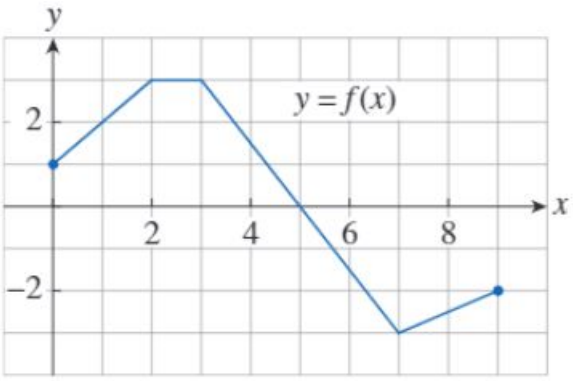

Figure 1: An image of function f

terms of areas.

(a) $\int_0^2 f(x)dx$

(b) $\int_0^5 f(x)dx$

(c) $\int_5^7 f(x)dx$

(d) $\int_0^9 f(x)dx$?