

## Quiz 9

Name:

2017/04/06

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This quiz has 2 questions worth 14 points on 2 pages. Try to do as many questions as possible. You can use your calculator.

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1. (8 points) Suppose  $f(x)$  and  $g(x)$  are two continuous and differentiable functions such that  $f'(x) = g(x)$  and we have following conditions:

$$\begin{aligned}\int_0^5 f(x)dx &= -2 \\ \int_0^5 g(x)dx &= 15 \\ \int_5^{10} g(x)dx &= 2 \\ f(0) &= 7\end{aligned}$$

Determine each of the following expressions. If insufficient information is given to answer the equation indicate "Insufficient Info."

- (a) (2 points)  $\int_0^5 f(0)g(x)dx =$   
(b) (2 points)  $f(10) - f(0) =$   
(c) (2 points)  $\int_0^5 |f(x)| dx =$   
(d) (2 points)  $\int_0^5 \frac{1}{g(x)} dx =$

**Solution:**

- $\int_0^5 f(0)g(x)dx = f(0) \int_0^5 g(x)dx = 7 * 15 = 105$
- $f(10) - f(0) = \int_0^{10} g(x)dx = \int_0^5 g(x)dx + \int_5^{10} g(x)dx = 15 + 2 = 17$
- $\int_0^5 |f(x)| dx =$  Insufficient Info
- $\int_0^5 \frac{1}{g(x)} dx =$  Insufficient Info

2. (6 points) Let  $h$  be a continuous differentiable function of  $x$ . Suppose  $h$  is always **increasing**. The following is a table of values of  $h(x)$

$x$	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
$h(x)$	3	25	26	27	49	52	62	63

- (a) (2 points) Would a left-hand or a right-hand sum give a lower estimate of  $\int_{0.8}^1 h(x)dx$ ? Why?
- (b) (4 points) Using the table above, give upper and lower estimate of  $\int_1^{1.5} h(x)dx$

**Solution:**

1. Because  $h(x)$  is increasing, the LHS will give a lower estimate of  $\int_{0.8}^1 h(x)dx$

2.

$$\text{LHS} = 0.1(26 + 27 + 49 + 52 + 62) = 21.6$$

$$\text{RHS} = 0.1(27 + 49 + 52 + 62 + 63) = 25.3$$

So

$$21.6 \leq \int_1^{1.5} h(x)dx \leq 25.3$$