



AP Calculus AB – Unit 5

Problem Set 29: Properties of Integrals

For the following problems, let $\int_1^2 f(x)dx = 6$, $\int_2^5 f(x)dx = 9$, and $\int_1^5 g(x)dx = 4$

$$\begin{aligned}
 1. \int_1^5 f(x)dx & \\
 &= \int_1^2 f(x)dx + \int_2^5 f(x)dx \\
 &= 6 + 9 = \boxed{15}
 \end{aligned}$$

$$\begin{aligned}
 2. \int_1^5 (f(x) + g(x)) dx & \\
 &= 15 + 4 = \boxed{19}
 \end{aligned}$$

$$\begin{aligned}
 3. \int_5^1 2f(x) dx & \\
 &= 2 \left(-\int_1^5 f(x) dx \right) \\
 &= 2(-15) = \boxed{-30}
 \end{aligned}$$

$$\begin{aligned}
 4. \int_5^1 (2g(x) - 3f(x)) dx & \\
 &= -2 \int_1^5 g(x) dx - 3(-1) \int_1^5 f(x) dx \\
 &= -2(4) + 3(15) = \boxed{37}
 \end{aligned}$$

For the following problems, let $\int_0^5 f(x)dx = 1$, $\int_0^8 f(x)dx = 5$, and $\int_0^8 g(x)dx = -2$

$$\begin{aligned}
 5. \int_5^8 f(x)dx & \\
 &= \int_0^8 f(x)dx - \int_0^5 f(x)dx \\
 &= 5 - 1 \\
 &= \boxed{4}
 \end{aligned}$$

$$\begin{aligned}
 6. \int_8^0 -g(x)dx & \\
 &= -(-1) \int_0^8 g(x)dx \\
 &= \cancel{1}(-2) \\
 &= \boxed{-2}
 \end{aligned}$$

$$\begin{aligned}
 7. \int_0^8 (f(x) - g(x)) dx & \\
 &= 5 - (-2) \\
 &= \boxed{7}
 \end{aligned}$$

$$\begin{aligned}
 8. \int_8^8 f(x)g(x) dx & \\
 \uparrow & \\
 \text{same bounds} & \\
 &= \boxed{0}
 \end{aligned}$$



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For any 2 functions $c(x)$ and $h(x)$, state whether the following statements are true or false.

9. $\int (2c(x) + 9h(x)) dx = 2 \int c(x) dx + 9 \int h(x) dx$

True

10. $\int (c(x) \cdot h(x)) dx = \int c(x) dx \cdot \int h(x) dx$

False

(isn't true for multiplication)

11. $\int (h(x))^3 dx = \left(\int h(x) dx \right)^3$

False

12. $\int_0^4 c(x) dx = 2 \int_0^2 c(x) dx$

False

(you can't just change the bounds willy nilly)

13. $\int_2^0 c(x) dx = - \int_0^2 c(x) dx$

True