## 4.19  Multiple Choice Problems on Integrals

**1102 (AP).** For any real number $b$, $\displaystyle\int_0^b |2x|\, dx$ is

A) $-b|b|$          B) $b^2$          C) $-b^2$          D) $b|b|$          E) None of these

**1103 (AP).** Let $f$ and $g$ have continuous first and second derivatives everywhere. If $f(x) \le g(x)$ for all real $x$, which of the following must be true?

I)   $f'(x) \le g'(x)$ for all real $x$

II)  $f''(x) \le g''(x)$ for all real $x$

III) $\displaystyle\int_0^1 f(x)\, dx \le \int_0^1 g(x)\, dx$
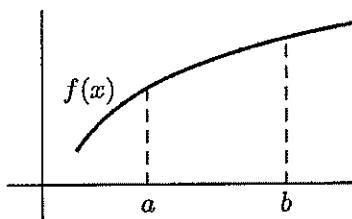
A) None          B) I only          C) III only          D) I and II          E) I, II, and III

**1104 (AP).** Let $f$ be a continuous function on the closed interval $[0,2]$. If $2 \le f(x) \le 4$, then the greatest possible value of $\displaystyle\int_0^2 f(x)\, dx$ is

A) 0          B) 2          C) 4          D) 8          E) 16

**1105 (AP).** If $f$ is the continuous, strictly increasing function on the interval $[a, b]$ as shown below, which of the following must be true?

I)   $\displaystyle\int_a^b f(x)\, dx < f(b)(b-a)$

II)  $\displaystyle\int_a^b f(x)\, dx > f(a)(b-a)$

III) $\displaystyle\int_a^b f(x)\, dx = f(c)(b-a)$ for some $c$ in $[a, b]$.



A) I only          B) II only          C) III only          D) I and II          E) I, II, and III

**1106 (AP).** Which of the following definite integrals is *not* equal to zero?

A) $\displaystyle\int_{-\pi}^{\pi} \sin^3 x\, dx$          B) $\displaystyle\int_{-\pi}^{\pi} x^2 \sin x\, dx$          C) $\displaystyle\int_0^{\pi} \cos x\, dx$

D) $\displaystyle\int_{-\pi}^{\pi} \cos^3 x\, dx$          E) $\displaystyle\int_{-\pi}^{\pi} \cos^2 x\, dx$

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Archimedes will be remembered when Aeschylus is forgotten, because languages die and mathematical ideas do not. —*G. H. Hardy*

**1114.** The acceleration of a particle moving along a straight line is given by $a = 6t$. If, when $t = 0$ its velocity $v = 1$ and its distance $s = 3$, then at any time $t$ the position function is given by

A) $s = t^3 + 3t + 1$

B) $s = t^3 + 3$

C) $s = t^3 + t + 3$

D) $s = \frac{1}{3}t^3 + t + 3$

E) $s = \frac{1}{3}t^3 + \frac{1}{2}t^2 + 3$

**1115.** If the displacement of a particle on a line is given by $s = 3 + (t - 2)^4$, then the number of times the particle changes direction is

A) 0          B) 1          C) 2          D) 3          E) None of these

**1116.** $\displaystyle\int_0^{\pi/2} \cos^2 x \sin x \, dx =$

A) $-1$          B) $-\frac{1}{3}$          C) 0          D) $\frac{1}{3}$          E) 1

**1117.** $\displaystyle\int_0^1 (3x^2 - 2x + 3) \, dx =$

A) 0          B) 5          C) 3          D) 8          E) None of these

**1118.** $\displaystyle\int_1^e \left( x - \frac{1}{2x} \right) \, dx =$

A) $\frac{1}{2}e^2$      B) $\frac{1}{2}e^2 + 1$      C) $\frac{1}{2}(e^2 + 1)$      D) $\frac{1}{2}(e^2 - 1)$      E) None of these

**1119.** $\displaystyle\int_0^1 (2 - 3x)^5 \, dx =$

A) $-\frac{1}{2}$      B) $\frac{1}{6}$      C) $\frac{1}{2}$      D) $-\frac{1}{18}$      E) None of these

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Work is the greatest thing in the world, so we should always save some of it for tomorrow. —_Don Herald_