OmniTest 3

1. A body of unknown temperature was placed in a room that was held at 30°F. After 25 minutes, the body's temperature was 0°F and, 50 minutes after the body was placed in the room, the body's temperature was 20°F. Use Newton's law of cooling to estimate the body's initial temperature.

2. Evaluate $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right)$.

   A) $\frac{\pi}{2}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{3}$

3. If $y = 4\tan^{-1}\left[-\frac{x}{6}\right]$, find $\frac{dy}{dx}$.

   A) $\frac{dy}{dx} = -\frac{2}{3(36 + x^2)}$ B) $\frac{dy}{dx} = \frac{2}{3(36 + x^2)}$

   C) $\frac{dy}{dx} = -\frac{24}{36 + x^2}$ D) $\frac{dy}{dx} = \frac{24}{36 + x^2}$

4. Evaluate $\int_{-\sqrt{2}}^{\sqrt{3}} \frac{dx}{\sqrt{4 - x^2}}$.

   A) π B) $\frac{7\pi}{12}$ C) $\frac{2\pi}{3}$ D) $\frac{5\pi}{6}$

5. True or False: If $y = \sin^{-1}(2x^2)$, then $\frac{dy}{dx} = \frac{-4x}{\sqrt{1 - 4x^4}}$.

6. Evaluate $\int_0^1 \frac{3x^2 dx}{1 + x^6}$.

7. A colony of bacteria is grown under ideal conditions in a laboratory so that the population increases exponentially with time. At the end of 2 hours there are 2500 bacteria. At the end of 4 hours there are 10,000. True or False: There were 1250 bacteria present initially.

8. Evaluate $\int_0^2 2^{3x} dx$.

   A) $\ln 2$ B) $\frac{21}{\ln 2}$ C) $21 \ln 2$ D) $\frac{189}{\ln 2}$

9. If $y = x^3 e^{3x^4}$, find $\frac{dy}{dx}$.

10. Evaluate $\int_0^{\ln 15} \frac{e^x dx}{1 + e^x}$.

    A) $\frac{3}{2} \ln 2$ B) $3 \ln 2$ C) $4 \ln 2$ D) $2 \ln 2$