CALC ACTIVE

AP Calculus AB
Unit 5 – Day 7 – Assignment

Name: Answer Key *

(1) If $f(x) = \sin\left(\frac{x}{2}\right)$, then there exists a number c on the interval $\frac{\pi}{2} < x < \frac{3\pi}{2}$ that satisfies the conclusion of the Mean Value Theorem. Which of the following values could be c?

(A) $\frac{2\pi}{3}$ (B) $\frac{3\pi}{4}$ (C) $\frac{5\pi}{6}$ (D) π (E) $\frac{3\pi}{2}$

$f'(c) = \frac{f(a) - f(b)}{a - b}$ $\qquad f'(x) = \frac{1}{2}\cos\left(\frac{x}{2}\right)$

$\frac{1}{2}\cos\left(\frac{c}{2}\right) = \frac{f\left(\frac{\pi}{2}\right) - f\left(\frac{3\pi}{2}\right)}{\frac{\pi}{2} - \frac{3\pi}{2}}$

$\frac{1}{2}\cos\left(\frac{c}{2}\right) = \frac{0.707 - 0.707}{\frac{\pi}{2} - \frac{3\pi}{2}}$

$\frac{1}{2}\cos\left(\frac{c}{2}\right) = 0$ $\qquad c = 3.142$

(y_1 = left side, y_2 = 0)

(2) A particle moves along a line so that at time t, where $0 \le t \le \pi$, its position is given by $s(t) = -4\cos t - \frac{t^2}{2} + 10$. What is the velocity of the particle when its acceleration is zero?

$-4\cos t - \frac{1}{2}t^2 + 10$

(A) –5.19 (B) 0.74 (C) 1.32 (D) 2.55 (E) 8.13

$v(t) = s'(t) = 4\sin t - t$

$a(t) = v'(t) = 4\cos t - 1$

$4\cos t - 1 = 0$

$\cos t = 1/4$ (y_1 = left side, y_2 = 1/4)

$t = 1.318$ $\longrightarrow$ $v(1.318) = 4\sin(1.318) - 1.318$

$= 2.555$