

# AP<sup>®</sup> Calculus Portfolio ~

Mr. Down, Assignment #1

Final Mark (     /     )

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Date: 05-12-20

Due: 05-13-20

Please provide full solutions. Your reasoning is equally as important as the correct answer.

#1 If  $f(x) = -x^3 + x + \frac{1}{x}$ , then  $f'(-1) =$

$$f'(x) = -3x^2 + 1 - \frac{1}{x^2}$$

$$f'(-1) = -3(-1)^2 + 1 - \frac{1}{(-1)^2} = -3$$

(A) 3

(B) 1

(C) -1

(D) -3

(E) -5

#2 An equation of the line tangent to the graph of  $y = \cos(2x)$  at  $x = \frac{\pi}{4}$  is

(A)  $y - 1 = -\left(x - \frac{\pi}{4}\right)$

(B)  $y - 1 = -2\left(x - \frac{\pi}{4}\right)$

(C)  $y = 2\left(x - \frac{\pi}{4}\right)$

(D)  $y = -\left(x - \frac{\pi}{4}\right)$

(E)  $y = -2\left(x - \frac{\pi}{4}\right)$

$$y\left(\frac{\pi}{4}\right) = \cos\left(2 \cdot \frac{\pi}{4}\right) = \cos\left(\frac{\pi}{2}\right) = 0$$

$$y' = -\sin(2x) \cdot 2 = -2\sin(2x)$$

$$y'\left(\frac{\pi}{4}\right) = -2\sin\left(2 \cdot \frac{\pi}{4}\right) = -2\sin\left(\frac{\pi}{2}\right) = -2 = m$$

$$y - y\left(\frac{\pi}{4}\right) = y'\left(\frac{\pi}{4}\right)\left(x - \frac{\pi}{4}\right)$$

$$y - 0 = -2\left(x - \frac{\pi}{4}\right)$$

$$y = -2\left(x - \frac{\pi}{4}\right)$$

#3 If  $f(x) = x\sqrt{2x-3}$ , then  $f'(x) =$

(A)  $\frac{3x-3}{\sqrt{2x-3}}$

(B)  $\frac{x}{\sqrt{2x-3}}$

(C)  $\frac{1}{\sqrt{2x-3}}$

(D)  $\frac{-x+3}{\sqrt{2x-3}}$

(E)  $\frac{5x-6}{2\sqrt{2x-3}}$

$$f(x) = x(2x-3)^{1/2}$$

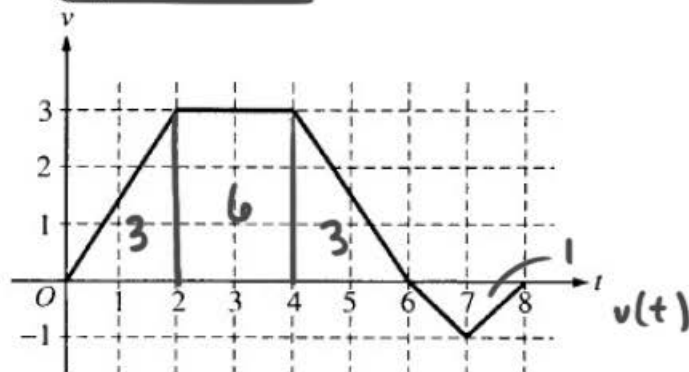
$$f'(x) = (2x-3)^{1/2} \cdot (1) + (x) \cdot \frac{1}{2}(2x-3)^{-1/2} \cdot 2$$

$$f'(x) = \sqrt{2x-3} + \frac{x}{\sqrt{2x-3}}$$

$$f'(x) = \frac{(2x-3) + x}{\sqrt{2x-3}} = \frac{3x-3}{\sqrt{2x-3}}$$

Questions #4 and #5 refer to the following situation

A bug begins to crawl up a vertical wire at time  $t = 0$ . The velocity  $v$  of the bug at time  $t$ ,  $0 \leq t \leq 8$ , is given by the function whose graph is shown below.



#4 At what value of  $t$  does the bug change direction?

- (A) 2 (B) 4 (C) 6 (D) 7 (E) 8

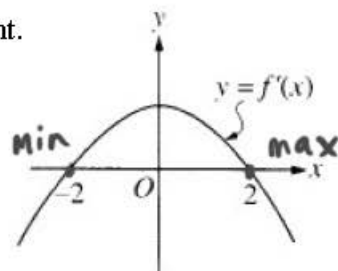
The bug changes direction at  $t=6$  because  $v(t)$  changes from positive to negative

#5 What is the total distance the bug traveled from  $t = 0$  to  $t = 8$ ?

- (A) 14 (B) 13 (C) 11 (D) 8 (E) 6

$$\int_0^8 |v(t)| dt = |3 + 6 + 3 + (-1)| = 13$$

#6 The graph of the derivative of  $f$  is shown in the figure on the right. Which of the following could be the graph of  $f$ ?



$\therefore f'$  is a parabola  
 $\therefore f$  is not linear

