

**SECTION 1**

**QUESTION 1**

Given that  $f(x) = 15e^{\sin x}$ , the value of  $f'(0)$  is

- (A) -15
- (B) 0
- (C) 15
- (D) 30

**QUESTION 2**

The coastal tide at Lobster Bay has been modelled using the following function, where  $f$  is the tidal height,  $f = 0$  is the normal tidal level and  $x$  is the time in hours (where 0 corresponds to 12:00 am).

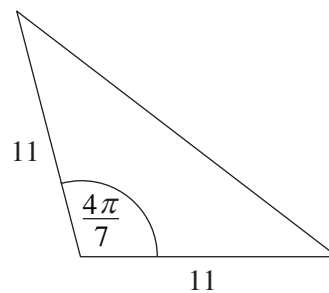
$$f(x) = -1.2 \cos\left(\frac{15\pi x + 31}{93}\right)$$

The rate of change at 5:30 am is approximately

- (A) 0.013 m/h
- (B) 0.074 m/h
- (C) 0.135 m/h
- (D) 0.194 m/h

**QUESTION 3**

Consider the triangle below.



Not drawn to scale

The area of the triangle is closest to

- (A) 1.9 units<sup>2</sup>
- (B) 59 units<sup>2</sup>
- (C) 68 units<sup>2</sup>
- (D) 118 units<sup>2</sup>

**QUESTION 8**

Assume that  $X$  is normally distributed with a mean of 51 and a standard deviation of 19.2.

What is the value of  $b$  such that  $P(X < b) = 0.6$ ?

- (A) 32.12
- (B) 46.14
- (C) 55.86
- (D) 67.16

**QUESTION 9**

Determine the area bounded by the  $x$ -axis and the function  $f(x) = 10\sqrt{\cos\left(\frac{\pi x}{4}\right)} - 7$ .

- (A) 2.51
- (B) 3.77
- (C) 5.48
- (D) 6.14

**QUESTION 10**

A probability density function is given by  $f(x) = \frac{1}{59}(0.027x^2 + x)$  defined for  $0 < x < 10$ .

Which of the following integrals represents the expected value?

- (A)  $\int_0^{10} \frac{x}{59}(0.027x^2 + x) dx$
- (B)  $x \int_0^{10} \frac{1}{59}(0.027x^2 + x) dx$
- (C)  $\int_0^{10} x \left( \frac{1}{59}(0.027x^2 + x) \right)^2 dx$
- (D)  $\int_0^{10} \frac{1}{59}(0.027x^2 + x) dx$

**QUESTION 1 C**

$$f'(x) = 15e^{\sin(x)} \times \cos(x)$$

$$\begin{aligned} f'(0) &= 15e^{\sin(0)} \times \cos(0) \\ &= 15 \end{aligned}$$

**QUESTION 2 A**

$$f(x) = -1.2 \cos\left(\frac{15\pi x + 31}{93}\right)$$

$$\begin{aligned} f'(x) &= 1.2 \sin\left(\frac{15\pi x + 31}{93}\right) \times \frac{15\pi}{93} \\ &= \frac{6\pi}{31} \sin\left(\frac{15\pi x + 31}{93}\right) \end{aligned}$$

$$\begin{aligned} f'(5.5) &= \frac{6\pi}{31} \left( \frac{15\pi \times 5.5 + 31}{93} \right) \\ &= 0.01298855199 \\ &\approx 0.013 \text{ m/h} \end{aligned}$$

**QUESTION 3 B**

$$\begin{aligned} \text{area} &= \frac{1}{2}bc \sin(A) \\ &= \frac{1}{2} \times 11 \times 11 \sin\left(\frac{4\pi}{7}\right) \\ &\approx 59 \text{ units}^2 \end{aligned}$$