

Classroom Voting Questions: Calculus I

2.2 The Derivative at a Point

1. We want to find how the volume of a balloon changes as it is filled with air. We know $V(r) = \frac{4}{3}\pi r^3$, where r is the radius in inches and $V(r)$ is the volume in cubic inches. The expression $\frac{V(3)-V(1)}{3-1}$ represents the
 - (a) Average rate of change of the radius with respect to the volume when the radius changes from 1 inch to 3 inches.
 - (b) Average rate of change of the radius with respect to the volume when the volume changes from 1 cubic inch to 3 cubic inches.
 - (c) Average rate of change of the volume with respect to the radius when the radius changes from 1 inch to 3 inches.
 - (d) Average rate of change of the volume with respect to the radius when the volume changes from 1 cubic inch to 3 cubic inches.

2. We want to find how the volume of a balloon changes as it is filled with air. We know $V(r) = \frac{4}{3}\pi r^3$, where r is the radius in inches and $V(r)$ is the volume in cubic inches. Which of the following represents the rate at which the volume is changing when the radius is 1 inch?
 - (a) $\frac{V(1.01)-V(1)}{0.01} \approx 12.69 \text{ in}^3$
 - (b) $\frac{V(0.99)-V(1)}{-0.01} \approx 12.44 \text{ in}^3$
 - (c) $\lim_{h \rightarrow 0} \frac{V(1+h)-V(1)}{h}$
 - (d) All of the above

3. Which of the following represents the slope of a line drawn between the two points marked in the figure?

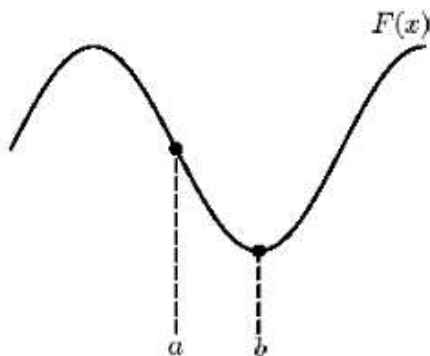


Figure 2.4

(a) $m = \frac{F(a)+F(b)}{a+b}$

(b) $m = \frac{F(b)-F(a)}{b-a}$

(c) $m = \frac{a}{b}$

(d) $m = \frac{F(a)-F(b)}{b-a}$

4. The line tangent to the graph of $f(x) = x$ at $(0,0)$

(a) is $y = 0$

(b) is $y = x$

(c) does not exist

(d) is not unique. There are infinitely many tangent lines.

5. Suppose that $f(x)$ is a function with $f(2) = 15$ and $f'(2) = 3$. Estimate $f(2.5)$.

(a) 10.5

(b) 15

(c) 16.5

(d) 18