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 is 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 is in cubic inches. Which of the following represents the rate at which the volume is changing when the radius is 1 inch?

   (a) $\frac{V(1.01)-V(1)}{0.01} \approx 12.69$

   (b) $\frac{V(0.99)-V(1)}{-0.01} \approx 12.44$

   (c) $\lim_{h\to 0} \frac{V(1+h)-V(1)}{h}$

   (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?

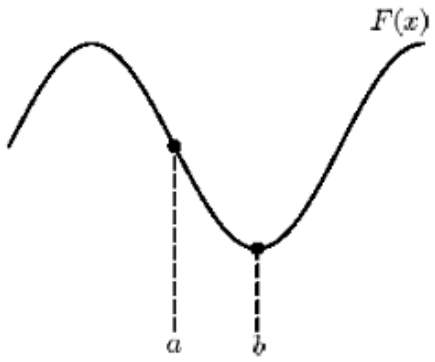

Figure 2.4

(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