For questions 10-13, use the chart below, which gives selected values for differentiable functions $f(x)$ and $g(x)$ and their derivatives.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	2	1	5	−4
1	3	2	3	−3
2	5	3	1	−2
3	10	4	0	−1

_____ 10. If $h(x) = f(x) + 2g(x)$, then $h'(3) =$

(A) −2 (B) 2 (C) 7 (D) 8 (E) 10

_____ 11. If $h(x) = f(x) \cdot g(x)$, then $h'(2) =$

(A) −20 (B) −7 (C) −6 (D) −1 (E) 13

_____ 12. If $h(x) = \dfrac{1}{g(x)}$, then $h'(1) =$

(A) $-\dfrac{1}{2}$ (B) $-\dfrac{1}{3}$ (C) $-\dfrac{1}{9}$ (D) $\dfrac{1}{9}$ (E) $\dfrac{1}{3}$

_____ 13. If $h(x) = \dfrac{f(x)}{g(x)}$, then $h'(0) =$

(A) $-\dfrac{13}{25}$ (B) $-\dfrac{1}{4}$ (C) $\dfrac{13}{25}$ (D) $\dfrac{13}{16}$ (E) $\dfrac{22}{25}$

6. The volume of a right circular cylinder is given by $V = \pi r^2 h$. If the radius of such a cylinder is given by $r = \sqrt{t+2}$ and its height is $h = \frac{\sqrt{t}}{2}$, where t is time in seconds and the dimensions are in inches.

(a) Find an equation for the volume, $V(t)$, of the right circular cylinder as a function of time.

(b) Find the rate of change of volume with respect to time, $V'(t) = \frac{dV}{dt}$.

(c) How fast is the volume of the cylinder changing when $t = 1$?

For questions 10-13, use the chart below, which gives selected values for differentiable functions $f(x)$ and $g(x)$ and their derivatives.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	2	1	5	–4
1	3	2	3	–3
2	5	3	1	–2
3	10	4	0	–1

B 10. If $h(x)=f(x)+2g(x)$, then $h'(3)=$

(A) –2 (B) 2 (C) 7 (D) 8 (E) 10

$h'(x)=f'(x)+2g'(x)$

$h'(3)=f'(3)+2g'(3)$

$=4+(2)(-1)$

$=2$

____ 11. If $h(x)=f(x)\cdot g(x)$, then $h'(2)=$

(A) –20 (B) –7 (C) –6 (D) –1 (E) 13

E 12. If $h(x)=\dfrac{1}{g(x)}$, then $h'(1)=$

(A) $-\dfrac{1}{2}$ (B) $-\dfrac{1}{3}$ (C) $-\dfrac{1}{9}$ (D) $\dfrac{1}{9}$ (E) $\dfrac{1}{3}$

$h'(x)=\dfrac{g(x)(0)-(1)(g'(x))}{(g(x))^2}$

$h(x)=\dfrac{-g'(x)}{(g(x))^2}$

$h'(1)=\dfrac{-g'(1)}{(g(1))^2}$

$=\dfrac{-(-3)}{(3)^2}$

$=\dfrac{3}{9}$

$=\dfrac{1}{3}$

____ 13. If $h(x)=\dfrac{f(x)}{g(x)}$, then $h'(0)=$

(A) $-\dfrac{13}{25}$ (B) $-\dfrac{1}{4}$ (C) $\dfrac{13}{25}$ (D) $\dfrac{13}{16}$ (E) $\dfrac{22}{25}$

6. The volume of a right circular cylinder is given by $V = \pi r^2 h$. If the radius of such a cylinder is given by $r = \sqrt{t+2}$ and its height is $h = \frac{\sqrt{t}}{2}$, where t is time in seconds and the dimensions are in inches.

(a) Find an equation for the volume, $V(t)$, of the right circular cylinder as a function of time.

$V = \pi r^2 h$

$V = \pi \left(\sqrt{t+2}\right)^2 \left(\frac{\sqrt{t}}{2}\right)$

$V(t) = \frac{\pi}{2}(t+2)(t^{1/2})$

(b) Find the rate of change of volume with respect to time, $V'(t) = \frac{dV}{dt}$.

$V'(t) = \frac{\pi}{2}\left[(1)(t^{1/2}) + (t+2)\left(\frac{1}{2}t^{-1/2}\right)\right]$

$= \left(\frac{\pi}{2}\right)\left(\frac{1}{2}t^{-1/2}\right)\left[2t + (t+2)\right]$ *factor out least power, $t^{-1/2}$

$V'(t) = \frac{\pi}{4\sqrt{t}}(3t+2)$

$V'(t) = \frac{\pi(3t+2)}{4\sqrt{t}}$

(c) How fast is the volume of the cylinder changing when $t = 1$?

$V'(1) = \left.\frac{dV}{dt}\right|_{t=1} = \frac{\pi(3(1)+2)}{4\sqrt{1}}$

$= \frac{\pi(5)}{4}$

$= \frac{5\pi}{4}$