#3-9.

3. f(x) | g(x) f(x)

f(x) | 16

$f'(x)=6$

$f(x)=4$

$g(x)=16$

$f(x)^2=g(x)$ find $g'(x)$

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

$2\cdot 4\cdot 6=g'(x)$

$g'(x)=48$.

The rate of the area of the square increasing when the area is $16cm^2$ is $48cm^2/s$.

4. l(x) | g(x) w(x) | 200 10

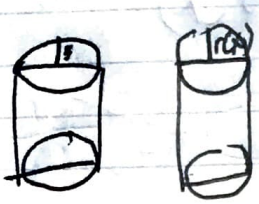
$l(x)\cdot w(x)=g(x)$

$\frac{d}{dx}: w'(x)\cdot l(x)+l'(x)\cdot w(x)=g'(x)$

$3\cdot 20+8\cdot 10=g'(x)$

$g'(x)=160$

Iterate of the area of the rect increasing when the length is 20cm and the width is 10cm is $160cm^2$

5. 

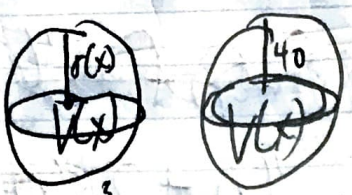
$\pi r^2 h=V$

$\pi r^2 h'=V'$

$\pi 5^2\cdot h'=3$

$h'=\frac{3}{25\pi}$

Height of water increasing at $\frac{3 \text{ meters}}{25\pi \text{ min}}$

6. $\frac{4}{3}\pi r^3$ 

$V(x)=\frac{4}{3}\pi r(x)^3$

$V'(x)=\frac{4}{3}\pi\ 3r(x)^2\cdot r'(x)$

$V'(x)=4\pi\cdot 40^2\cdot 4$

$V'(x)=25600\pi m^3/s$

10. ~~$xy=8$~~

$y=\frac{8}{x}$

$y'=\frac{0-8}{x^2}$

~~$xy'+y=0$~~

$y'=-\frac{y}{x}$

16. $xy = 8$

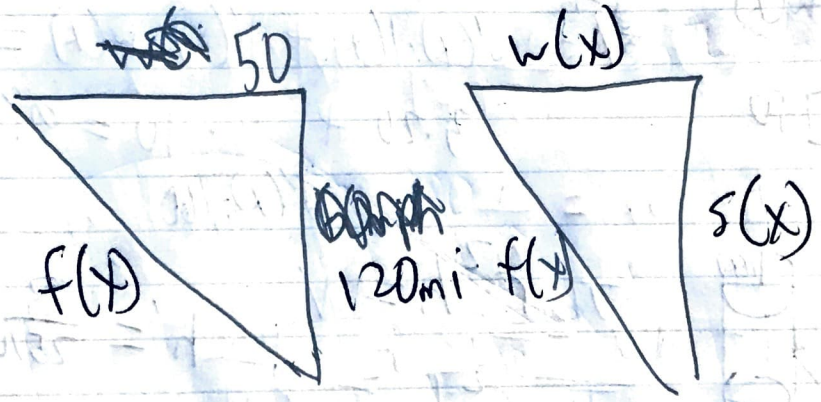
find $\frac{dx}{dt}$ $\quad \frac{dy}{dt} \cdot x + \frac{dx}{dt} \cdot y = 0$

$\frac{dy}{dt} \cdot 4 + \frac{dx}{dt} \cdot 2 = 0$

$-12 + 2\frac{dx}{dt} = 0$

$\frac{dx}{dt} = 6 \text{ cm/s}.$

15.



$w(x)^2 + s(x)^2 = f(x)^2$

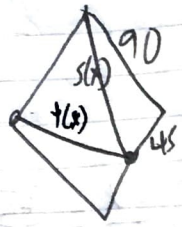
~~$s'(x) \cdot w(x) + w'(x) \cdot s(x) = f'(x)$~~

$2w(x) \cdot w'(x) + 2s(x) \cdot s'(x) = 2f(x) \cdot f'(x)$

$2 \cdot 50 \cdot 25 + 2 \cdot 120 \cdot 60 = 2 \cdot f(x) \cdot f'(x)$

$f'(x) = \frac{9700}{\sqrt{50^2 + 120^2}}$

18.



$s(x)^2 = f(x)^2 + h(x)^2$

$2s(x) \cdot s'(x) = 2f(x) \cdot f'(x) + 2h(x) \cdot h'(x)$

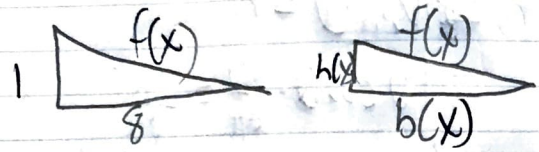
$s(x) \cdot s'(x) = 90 \cdot 0 + 45 \cdot 24$

$s'(x) = \frac{-1080}{100.623}$

$s'(x) = -10.733$

$f'(x) = 10.733$

20.



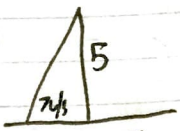
$f(x)^2 = h(x)^2 + b(x)^2$

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

$2 \cdot \sqrt{65} \cdot -1 = 2 \cdot 1 \cdot 0 + 2 \cdot 8 \cdot b'(x)$

$\frac{-2\sqrt{65}}{16} = b'(x)$

41.



$\tan(\theta) = \frac{5}{x}$

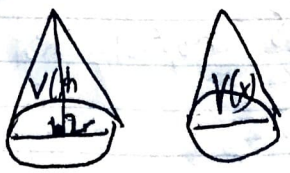
$5 \cdot \cot(\theta) = x$

$\frac{d}{dt} 5 \cdot \cot(\theta) = \frac{d}{dt} x$

$5 \cdot -\csc^2(\theta) \cdot \frac{d\theta}{dt} = \frac{dx}{dt}$

$\frac{dx}{dt} = 5 \cdot -\csc^2(x) \cdot \frac{-\pi}{6}$

27.



$V = \pi r^2 \frac{h}{3}$ $h = 2r$

find $\frac{dh}{dt}$

$V = \pi r^2 \frac{2r}{3}$

$V = \frac{2\pi}{3} r^3$

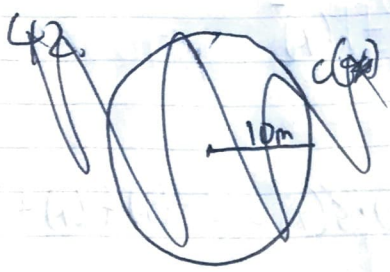
$r' = \frac{15}{25\pi}$

$h' = \frac{30}{25\pi}$

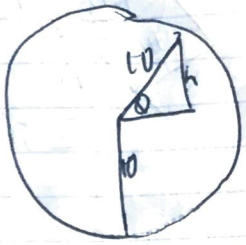
$V' = \frac{2\pi}{3} \cdot 3r^2 \cdot r' = 2\pi \cdot 25 \cdot r' = 30$

just for practice

42.



42 is weird



$\frac{d\theta}{dt} = \frac{2\pi}{2} = \pi$

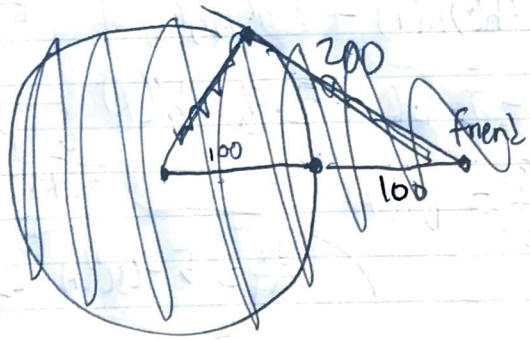
$10\sin\theta = h$

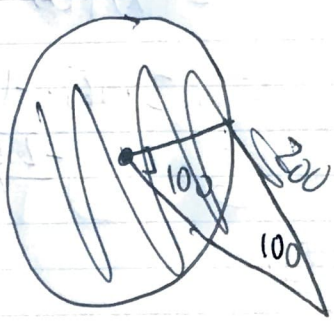
$10\cos\theta \cdot \frac{d\theta}{dt} = \frac{dh}{dt}$

$10\cos\frac{\pi}{10} \cdot \pi = \frac{dh}{dt}$

8π m/min

45.





i give up on 45, hopefully test is easier :)