19 $A = \pi r^2$

$\frac{dr}{dt} = 4$ ft/min

Need to find $\frac{dA}{dt}$ when $r = 10$ ft.

$$\frac{dA}{dt} = \frac{d(\pi r^2)}{dt} = \pi 2r \frac{dr}{dt}$$

$$\therefore \frac{dA}{dt} = \pi . 2 . 10 . 4 = \boxed{80\pi}$$

20 $4xe^y = 12 - \ln 729 + 6 \ln x$

$$\frac{d(4xe^y)}{dt} = \frac{d(12)}{dt} - \frac{d(\ln 729)}{dt} + \frac{d(6 \ln x)}{dt}$$

$$= 4x \frac{d(e^y)}{dt} + e^y . \frac{d(4x)}{dt} = 6 \frac{d(\ln x)}{dt}$$

$$= 4x . e^y \frac{dy}{dt} + 4e^y \frac{dx}{dt} = 6 . \frac{1}{x} . \frac{dx}{dt}$$

$\frac{dx}{dt} = 9$, $x = 3$, $y = 0$

$$\Rightarrow 4 . 3 . e^0 . \frac{dy}{dt} + 4 . e^0 . 9 = 6 . \frac{1}{3} . 9$$

$$\Rightarrow 12 \frac{dy}{dt} + 36 = 18$$

$$\Rightarrow 12 \frac{dy}{dt} = -18$$

$$\Rightarrow \boxed{\frac{dy}{dt} = -\frac{3}{2}}$$