(15 pts) For each part, if the statement is always true, circle the printed capital T. If the state is sometimes false, circle the printed capital F. In each case, write a careful and clear justificatior counterexample.

(a) If $f(x)$ is continuous for all x then $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ exists for all x. (a) T F

TF= (2 PTS) Justification: (1 PT)

counterexample: $y = |x| = f(x)$

b) If $f(x) = 3^x$ then $f^{-1}(x) = \frac{\ln(x)}{\ln(3)}$ (a) T F

Justification: $y = 3^x = e^{x \ln 3} \Rightarrow \ln y = x \ln 3$

$\Rightarrow x = \frac{\ln y}{\ln 3}$

(c) $\arcsin(\frac{1}{3})$ is an angle whose sine is $\frac{1}{3}$. (a) T F

Justification: defn. of arcsin

(d) The function $y = 3 + 6e^{-kt}$, with k a positive constant, has a horizontal asymptote of $y = 6$. (b) T F

Justification: the asymptote is $y=3$

(e) If $f(x) = \frac{5}{e^x}$ then the derivative $f'(x)$ is decreasing for all x. (a) T F

Justification: $f'' = (5e^{-x})'' = (-5e^{-x})' = 5e^{-x} > 0$

$\Rightarrow f$ concave up $\Rightarrow f'$ increasing.