

SOLUTION TO HW 2

#1

$$a) \lim_{x \rightarrow 5} \frac{x^2 - 3x - 10}{x - 5} = \lim_{x \rightarrow 5} \frac{(x+2)(x-5)}{x-5} = \lim_{x \rightarrow 5} (x+2) = \boxed{7}$$

$$b) \lim_{x \rightarrow -1} \frac{\sqrt{x+5} - 2}{x+1} = \lim_{x \rightarrow -1} \frac{(\sqrt{x+5} - 2)(\sqrt{x+5} + 2)}{(x+1)(\sqrt{x+5} + 2)} =$$
$$= \lim_{x \rightarrow -1} \frac{x+5-4}{(x+1)(\sqrt{x+5} + 2)} = \lim_{x \rightarrow -1} \frac{1}{\sqrt{x+5} + 2} = \boxed{\frac{1}{4}}$$

$$c) \lim_{t \rightarrow 4} \frac{4-t}{t - \sqrt{3t+4}} = \lim_{t \rightarrow 4} \frac{(4-t)(t + \sqrt{3t+4})}{(t - \sqrt{3t+4})(t + \sqrt{3t+4})} =$$
$$= \lim_{t \rightarrow 4} \frac{(4-t)(t + \sqrt{3t+4})}{t^2 - (3t+4)} = \lim_{t \rightarrow 4} \frac{(4-t)(t + \sqrt{3t+4})}{(t+1)(t-4)}$$
$$= \lim_{t \rightarrow 4} -\frac{t + \sqrt{3t+4}}{t+1} = -\frac{4+4}{5} = \boxed{-\frac{8}{5}}$$

d) $\lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x^2}\right) = \boxed{0}$ by the Squeeze Theorem: for all

x near 0, $-x^4 \leq x^4 \cos\left(\frac{1}{x^2}\right) \leq x^4$, and

$$\lim_{x \rightarrow 0} -x^4 = 0 = \lim_{x \rightarrow 0} x^4, \text{ hence } \lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x^2}\right) = 0.$$

$$e) \lim_{x \rightarrow 0} \frac{\tan x}{2x} = \lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right) \left(\frac{1}{2 \cos x} \right) = \frac{1}{2}$$