

1. Find the limit, briefly justifying each step. Do not skip steps!:

7 pts.

$$\lim_{t \rightarrow 1} \frac{t^2 + t - 2}{t^2 - 1} = \lim_{t \rightarrow 1} \frac{(t-1)(t+2)}{(t-1)(t+1)}$$

$$= \lim_{t \rightarrow 1} \frac{t+2}{t+1} = \boxed{\frac{3}{2}}$$

2. Find the limit, briefly justifying each step. Do not skip steps!:

7 pts.

$$\lim_{x \rightarrow 0} \frac{x \csc(2x)}{\cos(5x)} = \lim_{x \rightarrow 0} \frac{x}{\sin(2x) \cos(5x)}$$

$$= \lim_{x \rightarrow 0} \frac{x}{\sin(2x)} \cdot \frac{1}{\cos(5x)}$$

$$= \lim_{x \rightarrow 0} \frac{2x}{2 \sin(2x)} \cdot \frac{1}{\cos(5x)} = \lim_{x \rightarrow 0} \frac{2x}{2 \sin(2x)} \cdot \lim_{x \rightarrow 0} \frac{1}{\cos(5x)}$$

$$= \frac{1}{2} \lim_{x \rightarrow 0} \frac{2x}{\sin(2x)} \cdot \frac{1}{1} = \frac{1}{2} \cdot 1 \cdot 1 = \boxed{\frac{1}{2}}$$

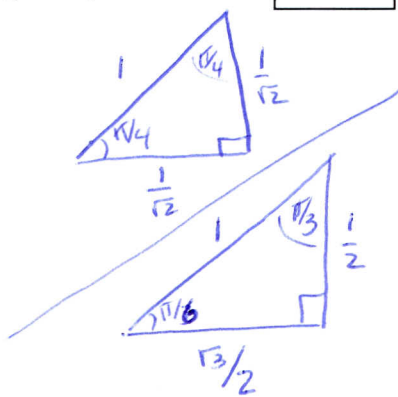
3. Complete each of the following. Labeling triangles may be useful!:

5 pts.

$$\sin\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} \quad \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$$

$$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2} \quad \cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$

$$\sin\left(\frac{\pi}{2}\right) = 1$$



4. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 1$,

5 pts.

then $\lim_{x \rightarrow 0} \frac{f(x)}{x} = \underline{0}$. Briefly Justify!

$$1 = \lim_{x \rightarrow 0} \frac{f(x)}{x^2} = \lim_{x \rightarrow 0} \frac{f(x)}{x} \cdot \frac{1}{x}$$

$$\lim_{x \rightarrow 0} \frac{f(x)}{x} = \frac{\lim_{x \rightarrow 0} \frac{f(x)}{x}}{\lim_{x \rightarrow 0} x} = \frac{0}{0}$$

The only way $\frac{0}{0} \rightarrow 1$ is if $\frac{f(x)}{x} \rightarrow 0$!!

5. Find $\sin \theta$ and $\tan \theta$ if $\cos \theta = \frac{1}{3}$ and $\theta \in \left[-\frac{\pi}{2}, 0\right]$.

ANSWER:

6 pts.

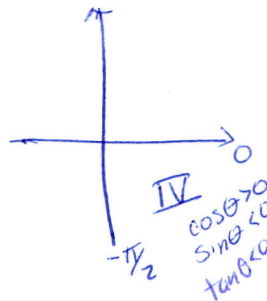
$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\sin^2 \theta + \frac{1}{9} = 1$$

$$\sin^2 \theta = \frac{8}{9} \Rightarrow \sin \theta = \pm \frac{\sqrt{8}}{3}$$

$\sin \theta < 0 \Rightarrow \sin \theta = -\frac{\sqrt{8}}{3}$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-\sqrt{8}/3}{1/3} = -\sqrt{8}$$



$$\sin \theta = \frac{-\sqrt{8}}{3} = \frac{-2\sqrt{2}}{3}$$

$$\tan \theta = -\sqrt{8}$$