

The rules: you may use your book and notes on this take-home quiz. Your work is to be entirely your own: you may not talk to anybody else about the quiz problems. Turn the quiz in on Monday, Sep. 20th.

Find the following limits.

$$1. (5\text{pts}) \lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 - 4} = \lim_{x \rightarrow 2} \frac{\cancel{(x-2)}(x^2 + 2x + 4)}{\cancel{(x-2)}(x+2)} = \frac{2^2 + 4 + 4}{2+2} = 3$$

$$2. (5\text{pts}) \lim_{x \rightarrow 8} \frac{x-8}{\sqrt{x}-\sqrt{8}} = \lim_{x \rightarrow 8} \frac{x-8}{\sqrt{x}-\sqrt{8}} \cdot \frac{\sqrt{x}+\sqrt{8}}{\sqrt{x}+\sqrt{8}} = \lim_{x \rightarrow 8} \frac{\cancel{(x-8)}(\sqrt{x}+\sqrt{8})}{\cancel{x-8}} = \sqrt{8}+\sqrt{8}$$

$$= 2\sqrt{8} = 4\sqrt{2}$$

$$3. (5\text{pts}) \lim_{h \rightarrow 0} \frac{\frac{1}{3+h} - \frac{1}{3}}{h} = \lim_{h \rightarrow 0} \frac{\frac{3-(3+h)}{(3+h)3}}{h} = \lim_{h \rightarrow 0} \frac{-h}{3(3+h)} \cdot \frac{1}{h} = \lim_{h \rightarrow 0} -\frac{1}{3(3+h)}$$

$$= -\frac{1}{3(3+0)} = -\frac{1}{9}$$

$$4. (5\text{pts}) \text{ Use the theorem that rhymes with "freeze" to find } \lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x} + 17\right).$$

$$-1 \leq \cos\left(\frac{1}{x} + 17\right) \leq 1 \quad | \cdot x^4$$

$$\text{so } \left. \begin{array}{l} -x^4 \leq x^4 \cos\left(\frac{1}{x} + 17\right) \leq x^4 \\ \text{Also } \lim_{x \rightarrow 0} x^4 = 0 \\ \lim_{x \rightarrow 0} -x^4 = 0 \end{array} \right\} \text{ By the squeeze theorem, } \lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x} + 17\right) = 0$$