

## Section 3.1

$$2.) \lim_{x \rightarrow 2} \frac{x^2 + 3}{x + 2} = \frac{2^2 + 3}{2 + 2} = \frac{7}{4}$$

$$3.) \lim_{x \rightarrow -1} \frac{2x}{1 + x^2} = \frac{2(-1)}{1 + (-1)^2} = \frac{-2}{2} = -1$$

$$6.) \lim_{t \rightarrow \frac{\pi}{9}} \sin(3t) = \sin\left(3 \cdot \frac{\pi}{9}\right) = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

$$7.) \lim_{x \rightarrow \frac{\pi}{2}} 2 \sec\left(\frac{x}{3}\right) = 2 \sec\left(\frac{\frac{\pi}{2}}{3}\right) = 2 \sec\left(\frac{\pi}{6}\right)$$

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

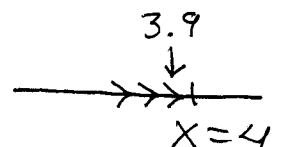
$$9.) \lim_{x \rightarrow -2} e^{-x^2/2} = e^{-(-2)^2/2} = e^{-4/2} = e^{-2}$$

$$10.) \lim_{x \rightarrow 0} \frac{e^x + 1}{2x + 3} = \frac{1 + 1}{3} = \frac{2}{3}$$

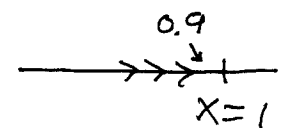
$$11.) \lim_{x \rightarrow 0} \ln(x + 1) = \ln 1 = 0$$

$$13.) \lim_{x \rightarrow 3} \frac{x^2 - 16}{x - 4} = \frac{-7}{-1} = 7$$

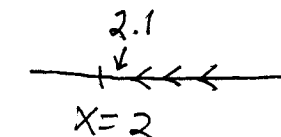
$$21.) \lim_{x \rightarrow 4^-} \frac{2}{x - 4} = \frac{2}{0^-} = -\infty$$



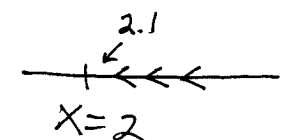
$$23.) \lim_{x \rightarrow 1^-} \frac{2}{1 - x} = \frac{2}{0^+} = +\infty$$



$$24.) \lim_{x \rightarrow 2^+} \frac{3}{2 - x} = \frac{3}{0^-} = -\infty$$



$$26.) \lim_{x \rightarrow 2^+} \frac{2}{x^2 - 4} = \frac{2}{0^+} = +\infty$$



$$28.) \lim_{x \rightarrow 0} \frac{1-x^2}{x^2} = \frac{1}{0^+} = +\infty$$

$$29.) \lim_{x \rightarrow 0} \frac{\sqrt{x^2+9}-3}{x^2} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow 0} \frac{\sqrt{x^2+9}-3}{x^2} \cdot \frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3}$$

$$= \lim_{x \rightarrow 0} \frac{(x^2+9)-9}{x^2(\sqrt{x^2+9}+3)} = \lim_{x \rightarrow 0} \frac{x^2}{x^2(\sqrt{x^2+9}+3)} = \frac{1}{3+3} = \frac{1}{6}$$

$$32.) \lim_{x \rightarrow 0} \frac{\sqrt{2-x}-\sqrt{2}}{2x} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow 0} \frac{\sqrt{2-x}-\sqrt{2}}{2x} \cdot \frac{\sqrt{2-x}+\sqrt{2}}{\sqrt{2-x}+\sqrt{2}}$$

$$= \lim_{x \rightarrow 0} \frac{(2-x)-2}{2x(\sqrt{2-x}+\sqrt{2})} = \lim_{x \rightarrow 0} \frac{-x}{2x(\sqrt{2-x}+\sqrt{2})}$$

$$= \frac{-1}{2(2\sqrt{2})} = \frac{-1}{4\sqrt{2}}$$

$$34.) \lim_{x \rightarrow \pm\infty} \frac{2x}{x-1} \stackrel{\frac{\infty}{\infty}}{=} \lim_{x \rightarrow \pm\infty} \frac{2x}{x-1} \cdot \frac{1/x}{1/x}$$

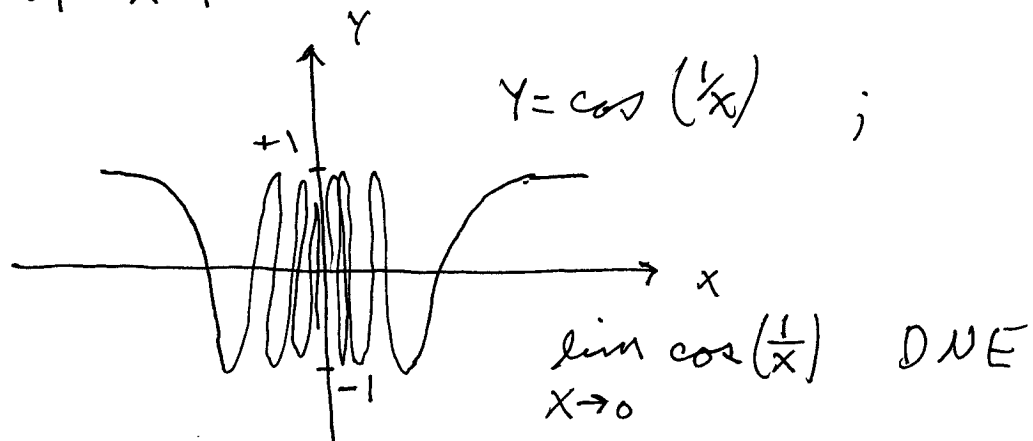
$$= \lim_{x \rightarrow \pm\infty} \frac{2}{1-\frac{1}{x}} = \frac{2}{1-0} = 2$$

$$\lim_{x \rightarrow 1^+} \frac{2x}{x-1} = \frac{2}{0^+} = +\infty$$

$$\lim_{x \rightarrow 1^-} \frac{2x}{x-1} = \frac{2}{0^-} = -\infty$$

$$\lim_{x \rightarrow 1} \frac{2x}{x-1} \text{ DNE}$$

36.)



$$\lim_{x \rightarrow 0} \cos\left(\frac{1}{x}\right) \text{ DNE}$$

(oscillates between -1 and 1)

$$41.) \lim_{x \rightarrow 3} (2x^2 - \frac{1}{x}) = 18 - \frac{1}{3} = \frac{53}{3}$$

$$47.) \lim_{x \rightarrow 1} \frac{1-x^2}{1-x} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow 1} \frac{(1-x)(1+x)}{1-x} = 2$$

$$49.) \lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow 3} \frac{(x-3)(x+1)}{x-3} = 4$$

$$50.) \lim_{x \rightarrow 1} \frac{(x-1)^2}{x^2 - 1} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow 1} \frac{(x-1)(x-1)}{(x-1)(x+1)} = \frac{0}{2} = 0$$

$$54.) \lim_{x \rightarrow \frac{1}{2}} \frac{1-x-2x^2}{1-2x} \stackrel{\frac{0}{0}}{=} \lim_{x \rightarrow \frac{1}{2}} \frac{(1-2x)(1+x)}{1-2x} \\ = 1 + \frac{1}{2} = \frac{3}{2}$$