

# 1.7 Selecting Procedures for Determining Limits

# Solutions

# Practice

Calculus

Evaluate each limit.

$$1. \lim_{x \rightarrow 0} \frac{\sqrt{x+7}-\sqrt{7}}{x} \cdot \frac{\sqrt{x+7}+\sqrt{7}}{\sqrt{x+7}+\sqrt{7}}$$

$$\lim_{x \rightarrow 0} \frac{x+7-7}{x(\sqrt{x+7}+\sqrt{7})}$$

$$\lim_{x \rightarrow 0} \frac{1}{\sqrt{x+7}+\sqrt{7}}$$

$$\boxed{\frac{1}{2\sqrt{7}}}$$

$$2. \lim_{x \rightarrow 1} \sqrt{x+4}$$

Direct substitution!

$$\boxed{\sqrt{5}}$$

$$3. \lim_{x \rightarrow 0} \frac{3 - \frac{1}{3(x+3)}}{x}$$

$$\lim_{x \rightarrow 0} \frac{3 - (x+3)}{3(x+3)x}$$

$$\lim_{x \rightarrow 0} \frac{-x}{3(x+3)} \cdot \frac{1}{x}$$

$$\lim_{x \rightarrow 0} \frac{-1}{3(x+3)}$$

$$\boxed{-\frac{1}{9}}$$

$$4. \lim_{x \rightarrow -3} \frac{x-2}{x^2-3x+2}$$

Direct substitution!

$$\frac{-5}{9+9+2} = \frac{-5}{20}$$

$$\boxed{-\frac{1}{4}}$$

$$5. \lim_{x \rightarrow 7} \frac{\sqrt{x+9}-4}{x-7} \cdot \frac{\sqrt{x+9}+4}{\sqrt{x+9}+4}$$

$$\lim_{x \rightarrow 7} \frac{(x+9)-16}{(x-7)(\sqrt{x+9}+4)}$$

$$\lim_{x \rightarrow 7} \frac{1}{\sqrt{x+9}+4}$$

$$\boxed{\frac{1}{8}}$$

$$6. \lim_{x \rightarrow 0} \frac{2x^5+3x^4}{x^4}$$

$$\lim_{x \rightarrow 0} x^4 \frac{(2x+3)}{x^4}$$

$$\lim_{x \rightarrow 0} (2x+3)$$

$$\boxed{3}$$

$$7. \lim_{x \rightarrow 6} \frac{x}{6 - \frac{1}{x+6}}$$

$$\lim_{x \rightarrow 6} \frac{x}{6 - \frac{1}{x+6}}$$

$$\lim_{x \rightarrow 6} x \cdot \frac{6(x+6)}{-x}$$

$$\frac{6(6+6)}{-1} = \boxed{-72}$$

$$8. \lim_{x \rightarrow 5} \frac{x^2-5x}{x-5}$$

$$\lim_{x \rightarrow 5} \frac{x(x-5)}{x-5}$$

$$\lim_{x \rightarrow 5} x$$

$$\boxed{5}$$

$$9. \lim_{x \rightarrow 0} \frac{\sqrt{x+9}-3}{x} \cdot \frac{\sqrt{x+9}+3}{\sqrt{x+9}+3}$$

$$\lim_{x \rightarrow 0} \frac{(x+9)-9}{x(\sqrt{x+9}+3)}$$

$$\lim_{x \rightarrow 0} \frac{1}{\sqrt{x+9}+3}$$

$$\boxed{\frac{1}{6}}$$

$$10. \lim_{x \rightarrow 1} \frac{\frac{1}{3x} - \frac{1}{3}}{x-1}$$

$$\lim_{x \rightarrow 1} \frac{\frac{x-1}{3x}}{x-1}$$

$$\lim_{x \rightarrow 1} \frac{x-1}{3x} \cdot \frac{1}{x-1}$$

$$\lim_{x \rightarrow 1} \frac{1}{3x} = \boxed{\frac{1}{3}}$$

$$11. \lim_{x \rightarrow 0} \frac{\sqrt{x+11}-\sqrt{11}}{x} \cdot \frac{\sqrt{x+11}+\sqrt{11}}{\sqrt{x+11}+\sqrt{11}}$$

$$\lim_{x \rightarrow 0} \frac{(x+11)-11}{x(\sqrt{x+11}+\sqrt{11})}$$

$$\lim_{x \rightarrow 0} \frac{1}{\sqrt{x+11}+\sqrt{11}} = \boxed{\frac{1}{2\sqrt{11}}}$$

$$12. \lim_{x \rightarrow 3} \frac{\sqrt{2x-6}}{x}$$

Direct  
Substitution

$$\frac{\sqrt{6-6}}{3}$$

$$\boxed{0}$$

$$13. \lim_{x \rightarrow 0} \frac{\frac{4}{(x+2)^2} - \frac{1}{4(x+2)^2}}{x}$$

$$\lim_{x \rightarrow 0} \frac{4 - (x^2 + 4x + 4)}{4(x+2)^2 x}$$

$$\lim_{x \rightarrow 0} \frac{-x^2 - 4x}{4(x+2)^2} \cdot \frac{1}{x}$$

$$\lim_{x \rightarrow 0} \frac{-x-4}{4(x+2)^2} = \frac{-4}{4(4)} = \boxed{-\frac{1}{4}}$$

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## Test Prep

$$14. \lim_{x \rightarrow b} \frac{b-x}{\sqrt{x}-\sqrt{b}} \text{ is } \frac{\sqrt{x}+\sqrt{b}}{\sqrt{x}+\sqrt{b}} \quad \lim_{x \rightarrow b} \frac{(b-x)(\sqrt{x}+\sqrt{b})}{x-b} = \lim_{x \rightarrow b} \frac{-1(x-b)(\sqrt{x}+\sqrt{b})}{(x-b)} = -(\sqrt{b}+\sqrt{b})$$

$$\text{(A) } -2\sqrt{b}$$

$$\text{(B) } -\sqrt{b}$$

$$\text{(C) } 2b$$

$$\text{(D) } \sqrt{b}$$

$$\text{(E) } 2\sqrt{b}$$