

Limits & Continuity

1.2A – Limits by Substitution

Finding each limit by substitution. You may have to simplify first.

$$\begin{aligned} \#1) \lim_{x \rightarrow 9} \sqrt{x+7} &= \sqrt{(9)+7} \\ &= \sqrt{16} \\ &= \boxed{4} \end{aligned}$$

$$\begin{aligned} \#2) \lim_{x \rightarrow 2} (4x^2 - 7x + 1) &= 4(2)^2 - 7(2) + 1 \\ &= 4(4) - 14 + 1 \\ &= 16 - 13 \\ &= \boxed{3} \end{aligned}$$

$$\begin{aligned} \#3) \lim_{x \rightarrow 15} \frac{2x^2 - 30x}{x - 15} &= \lim_{x \rightarrow 15} \frac{\cancel{2x(x-15)}}{\cancel{x-15}} \\ &= \lim_{x \rightarrow 15} 2x \\ &= 2(15) \\ &= \boxed{30} \end{aligned}$$

$$\#4) \lim_{x \rightarrow -5} \sqrt{77} = \boxed{\sqrt{77}}$$

$$\begin{aligned} \#5) \lim_{x \rightarrow 81} [(x-80)x^{1/2}] &= [(81)-80] (81)^{1/2} \\ &= [1] \cdot \sqrt{81} \\ &= 1 \cdot 9 \\ &= \boxed{9} \end{aligned}$$

$$\begin{aligned} \#6) \lim_{h \rightarrow 0} (3x^2h - 3xh + 33) &= 3x^2(0) - 3x(0) + 33 \\ &= \boxed{33} \end{aligned}$$

$$\begin{aligned} \#7) \lim_{h \rightarrow 5} \left[\frac{x^2 - 5}{x - 5} + h \right] &= \frac{x^2 - 5}{x - 5} + (5) \\ &= \frac{x^2 - 5}{x - 5} + 5 \end{aligned}$$

$$\begin{aligned} \#8) \lim_{x \rightarrow -5} \frac{x+5}{x^2+7x+10} &= \lim_{x \rightarrow -5} \frac{\cancel{x+5}}{\cancel{(x+5)}(x+2)} \\ &= \lim_{x \rightarrow -5} \frac{1}{x+2} \\ &= \frac{1}{(-5)+2} \\ &= \boxed{-\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} \#9) \lim_{x \rightarrow 0} \frac{6x^2 - 5x}{11x} &= \lim_{x \rightarrow 0} \frac{\cancel{x}(6x-5)}{11\cancel{x}} \\ &= \lim_{x \rightarrow 0} \frac{6x-5}{11} \\ &= \frac{6(0)-5}{11} \\ &= \boxed{-\frac{5}{11}} \end{aligned}$$

$$\begin{aligned} \#10) \lim_{h \rightarrow 0} \frac{3x^2h - 12xh^2 + 4h^3}{h} &= \lim_{h \rightarrow 0} \frac{h(3x^2 - 12xh + 4h^2)}{h} \\ &= \lim_{h \rightarrow 0} (3x^2 - 12xh + 4h^2) \\ &= 3x^2 - 12x(0) + 4(0)^2 \\ &= \boxed{3x^2} \end{aligned}$$

Limits & Continuity

1.2A – Limits by Substitution

Finding each limit by substitution. You may have to simplify first.

$$\begin{aligned} \#11) \lim_{x \rightarrow 9} \sqrt{x} &= \sqrt{9} \\ &= \textcircled{3} \end{aligned}$$

$$\begin{aligned} \#12) \lim_{x \rightarrow 2} (9x^2 - 8x + 4) &= 9(2)^2 - 8(2) + 4 \\ &= 9(4) - 16 + 4 \\ &= 36 - 12 \\ &= \textcircled{24} \end{aligned}$$

$$\begin{aligned} \#13) \lim_{x \rightarrow 4} \frac{2x^2 - 15}{5x + 1} &= \frac{2(4)^2 - 15}{5(4) + 1} \\ &= \frac{2(16) - 15}{20 + 1} \\ &= \frac{32 - 15}{21} \\ &= \textcircled{\frac{17}{21}} \end{aligned}$$

$$\#14) \lim_{x \rightarrow 2} \sqrt{11} = \textcircled{\sqrt{11}}$$

$$\begin{aligned} \#15) \lim_{x \rightarrow 16} [(x + 4)x^{-1/2}] &= [(16) + 4](16)^{-1/2} \\ &= [20] \cdot \frac{1}{\sqrt{16}} \\ &= \frac{20}{4} \\ &= \textcircled{5} \end{aligned}$$

$$\begin{aligned} \#16) \lim_{h \rightarrow 0} (9x^2h - 8xh + 4) &= 9x^2(0) - 8x(0) + 4 \\ &= \textcircled{4} \end{aligned}$$

$$\begin{aligned} \#17) \lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5} &= \lim_{x \rightarrow 5} \frac{\cancel{(x-5)}(x+5)}{\cancel{x-5}} \\ &= \lim_{x \rightarrow 5} (x+5) \\ &= (5) + 5 \\ &= \textcircled{10} \end{aligned}$$

$$\begin{aligned} \#18) \lim_{x \rightarrow -2} \frac{x+2}{x^2 + 7x + 10} &= \lim_{x \rightarrow -2} \frac{\cancel{x+2}}{\cancel{(x+2)}(x+5)} \\ &= \lim_{x \rightarrow -2} \frac{1}{x+5} \\ &= \frac{1}{(-2)+5} \\ &= \textcircled{\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} \#19) \lim_{x \rightarrow 0} \frac{x^3 + x^2 - x}{x^2 + x} &= \lim_{x \rightarrow 0} \frac{\cancel{x}(x^2 + x - 1)}{\cancel{x}(x+1)} \\ &= \lim_{x \rightarrow 0} \frac{x^2 + x - 1}{x+1} \\ &= \frac{(0)^2 + (0) - 1}{(0) + 1} \\ &= \frac{-1}{1} \\ &= \textcircled{-1} \end{aligned}$$

$$\begin{aligned} \#20) \lim_{h \rightarrow 0} \frac{8x^2h + 3xh^2 + h^3}{h} &= \lim_{h \rightarrow 0} \frac{h(8x^2 + 3xh + h^2)}{h} \\ &= \lim_{h \rightarrow 0} (8x^2 + 3xh + h^2) \\ &= 8x^2 + 3x(0) + (0)^2 \\ &= \textcircled{8x^2} \end{aligned}$$