Module 4 - Answers

4.1

Answer 1   4.1.1   The smaller of the two choices, 0.13, will ensure that the output is within 0.1 of 2. If a point on the graph of the function has an *x*-coordinate that is within 0.13 of 3, then it will lie between the two horizontal lines and its *y*-coordinate will be within 0.1 of 2. This means that in order to achieve a *y*-tolerance of 0.1 you need to have an *x*-tolerance of 0.13 (or less.)

Answer 2   4.1.2

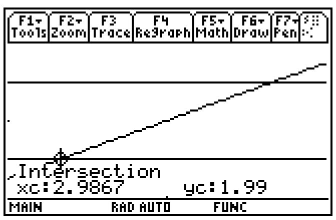
- Graph

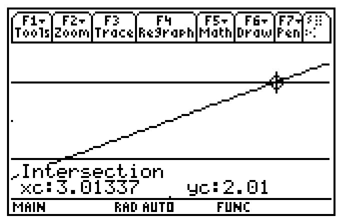
  y1 = $\sqrt{3x-5}$

  y2 = 2 – 0.01 = 1.99

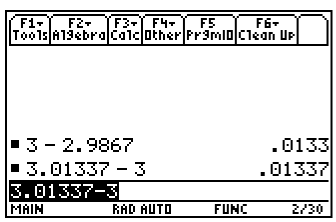
  y3 = 2 + 0.01 = 2.01

- Set the viewing window to [2.98, 3.02] x [1.98, 2.02]
- Find the intersection points by using the Intersect command





Use the intersection points to find the tolerance for *x* that produces a *y*-tolerance of 0.01.



Choose the smaller of the two tolerances. The *y*-tolerance is 0.01 when the *x*-tolerance is 0.0133.

4.2

Answer 1 4.2.1 Find a positive number δ so that $1.99 < \sqrt{3x-5} < 2.01$ whenever $3 - \delta < x < 3 + \delta$

Answer 2 4.2.2 $2.9867 < x < 3.01337$

Answer 3 4.2.3

Solve $3 - \delta \approx 2.9867$ and $3 + \delta \approx 3.01337$ for δ to obtain $\delta \approx 0.0133$ and $\delta \approx 0.01337$.

The correct tolerance is the minimum of the two values, $\delta \approx 0.0133$.

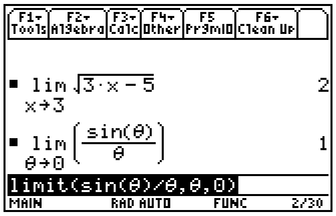
Answer 4 4.2.4 For each positive ε there is a positive δ such that

$$5 - \varepsilon < \sqrt{3x-5} < 5 + \varepsilon \text{ whenever } 10 - \delta < x < 10 + \delta$$

$\lim_{x\to 10} \sqrt{3x-5} = 5$ means that $\sqrt{3x-5} \to 5$ as $x \to 10$.

4.3

Answer 1 4.3.1



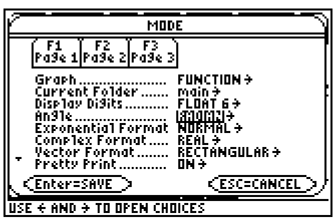
$$\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$$

Answer 2 4.3.2

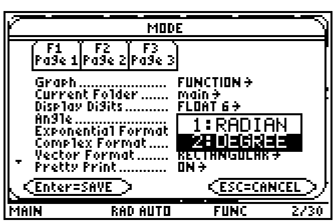
- Display the mode settings dialog box by pressing MODE

  The fourth item in the menu is the Angle mode.

- Select Angle's setting by pressing ▼ three times



- Open the Angle submenu by pressing ▶
- Highlight "Degree" by pressing ▼

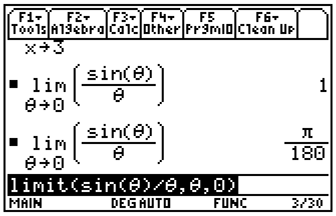


- Select "Degree" by pressing ENTER
- Save the changes and exit the Mode screen by press ENTER

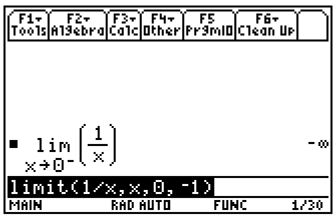
The mode settings under the Edit Line should say DEG to indicate the calculator is currently in Degree mode.

The limit function should still be on the Edit Line.

- Execute it again by pressing ENTER



Answer 3 4.3.3 $\lim_{x\to 0^-} \frac{1}{x}$ represents the value that *f(x)* = $\frac{1}{x}$ approaches as *x* approaches 0 from the left.



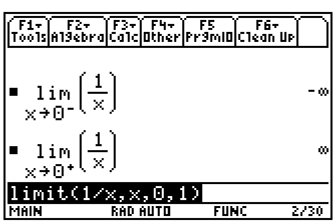
$$\lim_{x\to 0^-} \frac{1}{x} = -\infty$$

which is interpreted as

$\frac{1}{x} \to -\infty$ when *x* →0 from the left.

Answer 4 4.3.4

$\lim_{x\to 0^+} \frac{1}{x}$ represents the value that $f(x) = \frac{1}{x}$ approaches as *x* approaches 0 from the right.



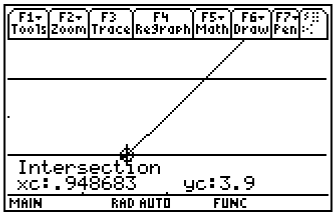
$$\lim_{x\to 0^+} \frac{1}{x} = \infty$$

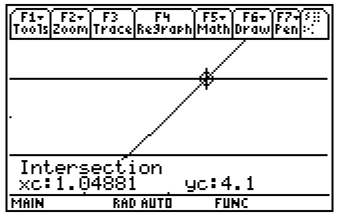
which is interpreted as

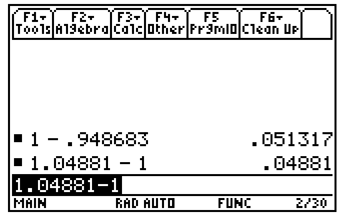
$\frac{1}{x} \to \infty$ when *x* →0 from the right.

Self Test

Answer 1



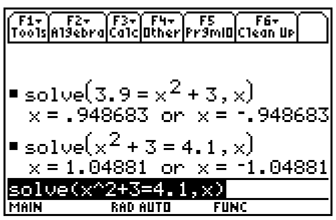




x should be within approximately 0.04881 of 1

Answer 2

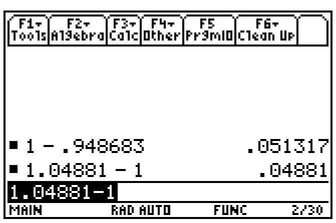
Find a positive number δ so that $3.9 < x^2 + 3 < 4.1$ whenever $1 - \delta < x < 1 + \delta$



Because x is near 1, the positive solutions are what we need. Therefore,

$1 - \delta = 0.948683$ and $1 + \delta = 1.04881$.

Solve for δ

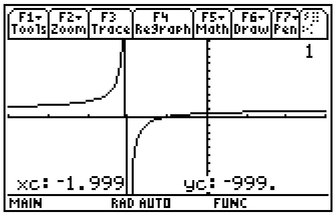


Taking the minimum of the two values, x should be within approximately 0.04881 of 1.

Answer 3

a. 4
b. 3
c. $-\infty$
d. ∞

Answer 4   Answers may vary but should include a graph of $y = \frac{x+1}{x+2}$ that shows the vertical asymptotic behavior of the function at $x = -2$. The Trace cursor should have an x-coordinate slightly to the right of $x = -2$ and show a large negative y-coordinate.



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