1. \[ \lim_{x \to \infty} \frac{-3\sqrt{x} + x^{-1}}{-3x + 5} \]

\[ \lim_{x \to \infty} \frac{-3\sqrt{x} + x^{-1}}{-3x + 5} = \lim_{x \to \infty} \frac{-3\sqrt{x}}{-3x + 5} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{x}}{-2x + 5} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{x}}{-2x + 5} \times \frac{x}{x} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{x^2}}{-2x + 5} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{1/x}}{-2 + 5} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{1/x}}{-2 + 5} \times \frac{x}{x} \]

\[ = \lim_{x \to \infty} \frac{-3\sqrt{1/x}}{-2 + 5} \times \frac{x}{x} \]

\[ = \frac{0}{-2} = 0 \]

\[ \text{High power of } x \text{ is } x. \]

\[ \text{Divided numerator and denominator by } x. \]

\[ \text{Rewrote } x \text{ as } x^2 \text{ in order to get it inside the square root.} \]

\[ \text{Simplified.} \]

\[ \text{Simplified more.} \]

\[ \text{Took limit by substituting each } x \text{ with } 0. \]

\[ \text{This is not indeterminate. Our limit is } 0. \]
2. \( \lim_{x \to \infty} \frac{3x+5}{\sqrt{5x^2+1}} \)

\[
\lim_{x \to \infty} \frac{3x+5}{\sqrt{5x^2+1}} = \lim_{x \to \infty} \frac{3x+5}{x \sqrt{\frac{5x^2}{x^2} + \frac{1}{x^2}}} \\
= \lim_{x \to \infty} \frac{3 + \frac{5}{x}}{\sqrt{5 + \frac{1}{x^2}}} \\
= \frac{3 + 0}{\sqrt{5 + 0}} \\
= \frac{3}{\sqrt{5}}
\]

**Final Answer:** A)
3. \( f(x) = \begin{cases} 
  x^2 + 3, & x < 1 \\
  2, & x = 1 \\
  x + 3, & x > 1 
\end{cases} \)

Test the right and left limits as \( x \) approaches 1.

To the Left: (i.e. \( x < 1 \))

\[
\lim_{x \to 1^-} f(x) = \lim_{x \to 1^-} x^2 + 3 = (1)^2 + 3 = 4
\]

We were able to take limit directly since our function was a polynomial.

To the Right: (i.e. \( x > 1 \))

\[
\lim_{x \to 1^+} f(x) = \lim_{x \to 1^+} x + 3 = (1) + 3 = 4
\]

Notice that the left and right limits both approach 4.

Thus, \( \lim_{x \to 1} f(x) = 4 \)

However, the initial problem states that \( f(1) = 2 \). Therefore, \( x = 1 \) is a removable discontinuity.

To remove discontinuity:

\[
f(1) = 4
\]

Thus,

\underline{Final Answer: A > 4}
4. \( f(x) = 5x \), \( g(x) = \frac{x}{5} \), \( h(x) = 5x + 15 \).

\[
\begin{align*}
f(g(h(x))) &= f\left(g\left(\frac{5x+15}{5}\right)\right) \\
&= f\left(\frac{5x+15}{5}\right) \\
&= \sqrt{\frac{5x+15}{5}}
\end{align*}
\]

Can Simplify:

\[
\int \sqrt{\frac{5x+15}{5}} = \int \sqrt{\frac{5(x+3)}{5}} = \sqrt{x+3}
\]

Work inside out for these types of problems. It makes them much easier to solve.

Final Answer: 13}
5. \[ \lim_{x \to 0} \frac{\sin 5x}{x} \]

\[ = \lim_{x \to 0} \frac{5 \cdot \sin 5x}{5 \cdot x} \]

\[ = 5 \lim_{x \to 0} \frac{\sin 5x}{5x} \]

\[ = 5 [1] \]

\[ = 5 \]

To use the given Rule, \( \lim_{x \to 0} \frac{\sin x}{x} = 1 \), note that what’s inside sine (in this case, 5x) must equal what is in the denominator (in this case, x). In our problem, they do not equal each other. Let’s fix that.

\[ \text{multiplied top and bottom by 5.} \]

\[ \text{Brought the constant, 5, out front.} \]

\[ \text{What’s inside sine now matches our denominator!} \]

\[ \text{We used our identity.} \]

Also, notice that we could have used L’Hôpital’s Rule for this problem:

\[ \lim_{x \to 0} \frac{\sin 5x}{x} = \lim_{x \to 0} \frac{\frac{d}{dx} \sin 5x}{\frac{d}{dx} x} = \lim_{x \to 0} \frac{5 \cos 5x}{1} = \lim_{x \to 0} 5 \cos 5x = 5 \]

Final Answer: \( C \)
\begin{align*}
\lim_{x \to 0} \frac{\tan 4x}{x} &= \lim_{x \to 0} \left( \frac{\sin 4x}{x \cos 4x} \right) \\
&= \lim_{x \to 0} \frac{\sin 4x}{x} \cdot \frac{1}{\cos 4x} \\
&= \lim_{x \to 0} \frac{4 \cdot \sin 4x}{4 \cdot x \cos 4x} \\
&= \lim_{x \to 0} \frac{4 \sin 4x}{4x \cos 4x} \\
&= \lim_{x \to 0} \left[ \frac{4}{\cos 4x} \cdot \frac{\sin 4x}{4x} \right] \\
&= \lim_{x \to 0} \frac{4}{\cos 4x} \cdot \lim_{x \to 0} \frac{\sin 4x}{4x} \\
&= \lim_{x \to 0} \frac{4}{\cos (0)} \cdot [1] \\
&= \frac{4}{1} \cdot [1] \\
&= 4
\end{align*}
Note that we could have also used L'Hospital's Rule to solve this problem, since \(\lim_{x \to 0} \frac{\tan 4x}{x} = \frac{0}{0}\) is indeterminate.

\[
\lim_{x \to 0} \frac{\tan 4x}{x} = \lim_{x \to 0} \frac{d}{dx} \frac{\tan 4x}{x} = \lim_{x \to 0} \frac{4 \sec^2(4x)}{x}
\]

\[
= \lim_{x \to 0} \frac{4 \sec^2(4x)}{1}
= \lim_{x \to 0} 4 \sec^2(4x)
= 4 \lim_{x \to 0} \left[ \frac{1}{\cos(4x)} \right]^2
\]

\[
= 4 \left[ \frac{1}{\cos(4 \cdot 0)} \right]^2
= 4 \left[ \frac{1}{1} \right]^2
= 4
\]

It gives us the same answer! But if a problem is not multiple choice, you have to use the method specified.

**Final Answer:** D)
7. \( \lim_{{x \to (\frac{\pi}{2})^+}} \tan x \)

**Draw Graph of \( \tan x \):**

We're asked to find the limit of the function as \( x \) approaches \( \frac{\pi}{2} \) from the right. (Our answer would be different if we approached from the left. It would be \( \infty \).)

As we come to \( \frac{\pi}{2} \) from the right, notice that it decreases forever. Thus, our limit \( \lim_{{x \to (\frac{\pi}{2})^+}} \tan x = -\infty \).

**Final Answer:** A)
8. \( \lim_{x \to 0^-} \frac{x^2}{3} - \frac{1}{x} \)

\[
\lim_{x \to 0^-} \left( \frac{x^2}{3} - \frac{1}{x} \right) = \lim_{x \to 0^-} \left( \frac{x^2}{3} \right) - \lim_{x \to 0^-} \frac{1}{x}
\]

Notice that \( x \) is approaching 0 from the left. We can make a number line to represent this:

\[\left\langle -\infty \quad -3 \quad -2 \quad -1 \quad 0 \quad \rightangle\]

\( x \to 0^- \) (coming to 0 from left)

Notice that every value to the left of zero is negative.

Thus,

\[
\lim_{x \to 0^-} \frac{x^2}{3} - \lim_{x \to 0^-} \frac{1}{x} = \frac{(-\infty)^2}{3} - \frac{1}{-\infty}
\]

\[= \frac{-\infty}{3} + \frac{1}{\infty}\]

\[= \infty\]

Because when you add any positive number to another positive number, you get a positive number.

Final Answer: A) \( \infty \)
9. \[ \lim_{x \to 8^+} \frac{1}{(x-8)^2} = \lim_{x \to 8^+} \frac{1}{\lim_{x \to 8^+} (x-8)^2} = \frac{1}{\infty} = 0 \]

\[ \text{Final Answer: } (C) \]
10. \( \lim_{x \to -2^-} \frac{x^2 - 6x + 8}{x^3 - 4x} = \)
\[
\lim_{x \to -2^-} \frac{x^2 - 6x + 8}{x^3 - 4x} = \frac{\lim_{x \to -2^-} \frac{\lim_{x \to -2^-} \left( x^2 - 6x + 8 \right)}{\lim_{x \to -2^-} x(x^2 - 4)}}{\lim_{x \to -2^-} x(x^2 - 4)}
\]
\[
= \frac{\lim_{x \to -2^-} \left( x^2 - 6x + 8 \right)}{\lim_{x \to -2^-} x(x^2 - 4)}
\]
\[
= \frac{(-2)^2 - 6(-2) + 8}{\lim_{x \to -2^-} x(x^2 - 4)}
\]
\[
= \frac{24}{2}
\]
\[
= 12
\]
\[
\lim_{x \to -2^-} x(x^2 - 4)
\]
\[
= -12
\]
\[
\frac{\lim_{x \to -2^-} x(x^2 - 4)}{\infty} = -\infty
\]

Final Answer: A)
11. \( \lim_{x \to -\pi} \sqrt[3]{x + 7} \cos(x + \pi) \)

Notice we can immediately plug in \(-\pi\):

\[
\lim_{x \to -\pi} \sqrt[3]{x + 7} \cos(x + \pi) = \sqrt[3]{(-\pi) + 7} \cos((-\pi) + \pi)
\]

\[
= \sqrt[3]{-\pi + 7} \cos(0)
\]

\[
= \sqrt[3]{-\pi + 7} (1)
\]

\[
= \sqrt[3]{-\pi + 7}
\]

\[
= \sqrt[3]{7 - \pi}
\]

**Final Answer:** \( 0 \)
12. \( \lim_{x \to 4^-} \frac{\sqrt{5x} \cdot (x-4)}{|x-4|} \)

\[
|x-4| = \begin{cases} 
  x-4, & \text{if } x-4 \geq 0 \Rightarrow x \geq 4 \\
  -(x-4), & \text{if } x-4 < 0 \Rightarrow x < 4 
\end{cases}
\]

The limit is asking for \( x \) approaches 4 from the left. So we use \(-(x-4)\), when rewriting \( |x-4| \).

\[
\lim_{x \to 4^-} \frac{\sqrt{5x} \cdot (x-4)}{|x-4|} = \lim_{x \to 4^-} \frac{\sqrt{5x} \cdot (x-4)}{-(x-4)}
\]

\[
= \lim_{x \to 4^-} \frac{\sqrt{5x}}{-1}
\]

\[
= \lim_{x \to 4^-} -\sqrt{5x}
\]

\[
= -\sqrt{\lim_{x \to 4^-} 5x}
\]

\[
= -\sqrt{5 \cdot 4}
\]

\[
= -\sqrt{20}
\]

\[
= -\sqrt{4 \cdot 5}
\]

\[
= -2\sqrt{5}
\]

\text{Final Answer: A) } -2\sqrt{5}
\[ \lim_{h \to 0^+} \frac{\sqrt{h^2 + 11h + 13} - \sqrt{13}}{h} \]

\[ = \lim_{h \to 0^+} \frac{\sqrt{h^2 + 11h + 13} - \sqrt{13}}{h} \cdot \frac{\sqrt{h^2 + 11h + 13} + \sqrt{13}}{\sqrt{h^2 + 11h + 13} + \sqrt{13}} \]

\[ \text{multiplied top and bottom by conjugate.} \]

\[ = \lim_{h \to 0^+} \frac{h^2 + 11h + 13 - 13}{h \left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \lim_{h \to 0^+} \frac{h^2 + 11h}{h \left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \lim_{h \to 0^+} \frac{h (h + 11)}{h \left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \lim_{h \to 0^+} \frac{h + 11}{\left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ \text{we canceled out the h on top and bottom.} \]

\[ = \lim_{h \to 0^+} \frac{h + 11}{\left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \lim_{h \to 0^+} \frac{h + 11}{h} \cdot \frac{1}{\left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \lim_{h \to 0^+} \frac{1}{\left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \cdot \lim_{h \to 0^+} (h + 11) \]

\[ = \lim_{h \to 0^+} \frac{h + 11}{\left( \sqrt{h^2 + 11h + 13} + \sqrt{13} \right)} \]

\[ = \frac{11}{\sqrt{13} + \sqrt{13}} = \frac{11}{2 \sqrt{13}} \]

\[ \text{Final Answer: C} \]
16. \( f(x) = \frac{x^2 + 2}{x^3} \)

a) \( x \)-intercepts: (set \( f(x) = 0 \))

\[
\frac{x^2 + 2}{x^3} = 0
\]

\[
x^2 + 2 = 0
\]

\[
x^2 = -2
\]

\[
x = \pm \sqrt{-2} \quad \text{not Real}
\]

No \( x \)-intercepts.

b) \( y \)-intercept:

\[
y = \frac{(0)^2 + 2}{(0)^3}
\]

\[
= \frac{2}{0} \quad \text{undefined}
\]

No \( y \)-intercept.

c) Vertical asymptotes:

In part (b) we determined the function \( f(x) \) is undefined at 0. So, we will take the limit as \( x \) approaches 0,

\[
\lim_{x \to 0} \frac{x^2 + 2}{x^3}
\]

\[
\lim_{x \to 0^-} \frac{x^2 + 2}{x^3} = -\infty
\]

\[
\lim_{x \to 0^+} \frac{x^2 + 2}{x^3} = +\infty
\]

This means we have a vertical asymptote at \( x = 0 \).
d) horizontal asymptotes:

\[
\lim_{x \to \infty} \frac{x^2 + 2}{x^3} = \lim_{x \to \infty} \frac{\frac{x^2}{x^3} + \frac{2}{x^3}}{\frac{x^3}{x^3}} = \lim_{x \to \infty} \frac{\frac{1}{x} + \frac{2}{x^3}}{1} = \frac{0 + 0}{1} \quad \text{not indeterminate}
\]

This means we have a horizontal asymptote at \( y = 0 \).

e) Graph symmetry:

\[
f(-x) = \frac{(-x)^2 + 2}{(-x)^3} = \frac{x^2 + 2}{-x^3} = -\frac{x^2 + 2}{x^3}
\]

If \( f(-x) = f(x) \) then symmetric about y-axis.

If \( f(-x) = -f(x) \) then symmetric about the origin.

\( f(-x) = -f(x) \), so our graph is symmetric about the origin.

**Final Answer: A**
17. \[ \lim_{x \to 1} \frac{x^2 - 1}{x^2 - 4x + 3} \]

\[ = \lim_{x \to 1} \frac{(x+1)(x-1)}{(x-3)(x-1)} \]

\[ = \lim_{x \to 1} \frac{x+1}{x-3} \]

\[ = \frac{(1)+1}{(1)-3} \]

\[ = \frac{2}{-2} \]

\[ = -1 \]

\textit{Final Answer: (B)}
18. \( \lim_{x \to 5} \frac{1}{x-5} \)

**From the left:**
\[
\lim_{x \to 5^-} \frac{1}{x-5} = \frac{1}{(-\infty)-5} = \frac{1}{-\infty} = -\infty
\]

**From the right:**
\[
\lim_{x \to 5^+} \frac{1}{x-5} = \frac{1}{(\infty)-5} = \frac{1}{\infty} = \infty
\]

\[\lim_{x \to 5^+} \neq \lim_{x \to 5^-} \]

Therefore, \( \lim_{x \to 5} \frac{1}{x-5} = \text{DNE} \)

**Final Answer:** A)
19. \( \lim_{x \to 0} f(x) \)

\[
\lim_{x \to 0^+} f(x) = 1 \\
\lim_{x \to 0^-} f(x) = -1
\]

\[
\lim_{x \to 0^+} f(x) \neq \lim_{x \to 0^-} f(x)
\]

Therefore, \( \lim_{x \to 0} f(x) = \text{DNE} \)

Final Answer: A)
20. \( y = \sqrt{10x + 9} \)

Square Roots are not defined when the inside is negative. We need to find out where the interval is continuous (i.e., defined).

Take the inside of the square root and set it equal to zero:

\[
10x + 9 = 0
\]

\[
10x = -9
\]

\[
x = \frac{-9}{10}
\]

This is a zero of our function. Square Roots are defined when their inside is 0, so we can include 0 in our interval.

\[
y = \sqrt{10\left(-\frac{9}{10}\right) + 9}
\]

\[
= \sqrt{-9 + 9}
\]

\[
= \sqrt{0}
\]

\[
= 0
\]

Therefore, anything less than zero would make the function undefined, or discontinuous. Our interval is:

\[
\left[-\frac{9}{10}, \infty\right)
\]

Final Answer: C)
21. \( y = \frac{x+5}{x^2-14x+48} \)

\[
\frac{x+5}{x^2-14x+48} = \frac{x+5}{(x-6)(x-8)}
\]

undefined when \( x = 6 \) or \( x = 8 \).

Therefore, the function is:

discontinuous only when \( x = 6 \) or \( x = 8 \).

Final Answer: \( B \)
22. \( f(x) = \begin{cases} 5x + 6, & \text{if } x < -1 \\ Kx + 8, & \text{if } x \geq -1 \end{cases} \)

Find limit at \(-1\).

\[
\lim_{x \to -1^-} f(x) = \lim_{x \to -1^-} (5x + 6) = 5(-1) + 6 = -5 + 6 = 1
\]

\[
\lim_{x \to -1^+} f(x) = \lim_{x \to -1^+} (Kx + 8) = K(-1) + 8 = -K + 8
\]

To be continuous at \(-1\), \( \lim_{x \to -1^-} f(x) = \lim_{x \to -1^+} f(x) \).

We already found these limits, now set them equal to each other.

\[
\lim_{x \to -1^-} f(x) = \lim_{x \to -1^+} f(x)
\]

\[
1 = -K + 8
\]

\[
1 + K = 8
\]

\[
K = 7
\]

Final Answer: \( C \)
\[
\lim_{x \to 0^-} f(x) = 0
\]
\[
\lim_{x \to 0^+} f(x) = 0
\]

Since \( \lim_{x \to 0^-} f(x) = \lim_{x \to 0^+} f(x) \), the limit exists, and the \( \lim_{x \to 0} f(x) = 0 \).

\[ \text{Final Answer: C} \]
Replace $f(x)$ with $y$.

$y = x^3 + 3$

Next, solve for $x$.

$y = x^3 + 3$
$y - 3 = x^3$
$\sqrt[3]{y-3} = x$

$X = \sqrt[3]{y-3}$

Finally, interchange $x$ and $y$.

$X = \sqrt[3]{y-3}$
$Y = \sqrt[3]{x-3}$

Therefore, our inverse function is:

$f^{-1}(x) = \sqrt[3]{x-3}$

Final Answer: A)
25. Remember, there are 3 different discontinuities.

- Removable — aka, a hole

- Infinite

- Jump

If any of these occur, the function is discontinuous. On our graph, there is a clear jump discontinuity at \( x = 2 \). Therefore, \( f \) is NOT Continuous.

Final Answer: B}
Choose the smaller number.
Therefore, \( \delta = 0.8025 \)

**Final Answer: C**
27. \( \lim_{x \to 5} f(x) = -4 \) and \( \lim_{x \to 5} g(x) = -6 \)

To find \( \lim_{x \to 5} [f(x) + g(x)]^2 \), substitute given limits of \( f(x) \) and \( g(x) \) into the expression and solve.

\[
\lim_{x \to 5} [f(x) + g(x)]^2 = \lim_{x \to 5} \left[ (-4) + (-6) \right]^2
\]

\[
= \lim_{x \to 5} \left[ -10 \right]^2
\]

\[
= \lim_{x \to 5} 100
\]

\[
= 100 \quad \text{Because the limit of a constant is just that constant.}
\]

Final Answer: \( \boxed{D} \)
28. \[
\lim_{\theta \to 3\pi} \tan (\pi \cos (\sin(\theta)))
\]

\[
\lim_{\theta \to 3\pi} \tan (\pi \cos (\sin(\theta))) = \tan \left( \lim_{\theta \to 3\pi} \pi \cos (\sin(\theta)) \right)
\]

\[
= \tan \left( \pi \lim_{\theta \to 3\pi} \cos (\sin(\theta)) \right)
\]

\[
= \tan \left( \pi \cos \left( \lim_{\theta \to 3\pi} \sin(\theta) \right) \right)
\]

\[
= \tan \left( \pi \cos \left( \sin(\lim_{\theta \to 3\pi} \theta) \right) \right)
\]

\[
= \tan \left( \pi \cos \left( \sin(3\pi) \right) \right) \quad \text{\(\leftarrow\) Took limit.}
\]

\[
= \tan \left( \pi \cos (0) \right) \quad \text{\(\leftarrow\) \(\sin 3\pi = 0\)}
\]

\[
= \tan \left( \pi \cdot (1) \right) \quad \text{\(\leftarrow\) \(\cos (0) = 1\)}
\]

\[
= \tan (\pi)
\]

\[
= 0 \quad \text{\(\leftarrow\) \(\tan \pi = 0\),}
\]

\[
\text{Because} \quad \tan \pi = \frac{\sin \pi}{\cos \pi} = \frac{0}{1} = 0.
\]

Since the limit is equal to the function value, the function is continuous at \(\theta = 3\pi\).

Final Answer: C)
29. \( y = x^2 - x, \ ( -2, 6 ) \)

Two ways to Solve.

**First way:** \( m = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h} \) at point \( P(a, f(a)) \)

We are basically looking for an equation of the line. \( m \) is our slope, which is what we first find.

\[
\begin{align*}
    n & = \lim_{h \to 0} \frac{[(-2+h)^2 - (-2+h)] - [6]}{h} \\
     & = \lim_{h \to 0} \frac{[(h^2 - 4h + 4) + 2 - h] - 6}{h} \\
     & = \lim_{h \to 0} \frac{[h^2 - 5h + 6] - 6}{h} \\
     & = \lim_{h \to 0} \frac{h^2 - 5h}{h} \\
     & = \lim_{h \to 0} h(h-5) \\
     & = \lim_{h \to 0} h - 5 \\
     & = -5
\end{align*}
\]

So, our slope is \( m = -5 \)
point slope formula: \( y - y_1 = m(x - x_1) \)

Thus, we plug in our slope \( m = -5 \) and point \((-2,6)\):

\[
\begin{align*}
y - 6 &= -5(x - (-2)) \\
&= -5(x + 2) \\
&= -5x - 10 \\
y &= -5x - 4
\end{align*}
\]

Second way:

By taking the derivative of a function, we essentially get the function of the slope.

\[
y = x^2 - x, \quad (2,6)
\]

\[
y' = 2x - 1 \quad \leftarrow \text{function of slope}
\]

Our point, \((-2,6)\), gives us what \( x \) is, so substitute \( x = -2 \) into our function of the slope, and we get our slope!

\[
m = 2(-2) - 1 = -5 \quad \leftarrow \text{slope}
\]

This way is much shorter than what we did on the previous page. Now plug your slope into your point slope formula, along with the given point \((-2,6)\), and you'll get the same answer!

Final Answer: D) \( y = -5x - 4 \)
30. \( y = \sqrt{2x} \), \([2, 8]\)

\[
\text{Average rate} = \text{slope of secant line}
\]

\[
= \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
= \frac{\sqrt{2 \cdot 8} - \sqrt{2 \cdot 2}}{8 - 2}
\]

\[
= \frac{\sqrt{16} - \sqrt{4}}{6}
\]

\[
= \frac{4 - 2}{6}
\]

\[
= \frac{2}{6}
\]

\[
= \frac{1}{3}
\]

Final Answer: \( A \)
14. \[ \lim_{x \to 4^-} \frac{x^2 - 6x + 8}{x^3 - 4x} = \lim_{x \to 4^-} \frac{x^2 - 6x + 8}{x(x^2 - 4)} \]

\[ = \lim_{x \to 4^-} \frac{(x^2 - 6x + 8)}{x^2 - 4} \]

\[ = \lim_{x \to 4^-} \frac{x^2 - 6x + 8}{(x - 4)(x + 4)} \cdot \lim_{x \to 4^-} (x - 4) \cdot \lim_{x \to 4^-} (x + 4) \]

\[ = \frac{4^2 - 6(4) + 8}{(4 - 4)(4 + 4)} \]

\[ = \frac{16 - 24 + 8}{0(16 - 4)} \]

\[ = \frac{0}{48} \]

\[ = 0 \]

Final Answer: 0

Notice this is not indeterminate, so we can say our limit is 0.
15. \( f(x) = \frac{\tan x}{x} \)

Basically, find out \( \lim_{x \to 0} f(x) \).

Thus, \( \lim_{x \to 0} f(x) = \lim_{x \to 0} \frac{\tan x}{x} \).

This is almost the exact problem as problem 6. You can solve the same way.

\[
\lim_{x \to 0^-} \frac{\tan x}{x} = 1
\]

\[
\lim_{x \to 0^+} \frac{\tan x}{x} = 1
\]

Since it is 1 coming from the left and right, we know the limit exists, and that the limit is 1.

Thus, \( f(0) = 1 \)

Final Answer: C)