(1) Evaluate and simplify \( \frac{32\frac{3}{5} \times 32\frac{3}{10}}{32\frac{3}{5}} = 32 \frac{2/5 + 3/10 - 7/10}{4/10 + 3/10 - 7/10} = 32^0 = 1 \)

(2) Rationalize the denominator of \( \frac{3}{1 + \sqrt{2}} \).

\[
\frac{3}{1 + \sqrt{2}} = \frac{3}{(1 + \sqrt{2})(1 - \sqrt{2})} = \frac{3 - 3\sqrt{2}}{1 - 2} = \frac{3 - 3\sqrt{2}}{-1} = -3\sqrt{2} - 3
\]

(3) Find the equation of the line which passes through the point (10, -3) and is parallel to the line \( 3x - 5y + 15 = 0 \) in slope-intercept form.

Solve for \( y \):

\[ 5y = 3x + 15 \] or \( y = \frac{3}{5}x + 3 \)

The slope of the parallel line is \( \frac{3}{5} \).

So \( y - (-3) = \frac{3}{5}(x - 10) \) or \( y = \frac{3}{5}x - 6 - 3 \)

or \( y = \frac{3}{5}x - 9 \)

(4) Let \( f(x) = \begin{cases} 
\frac{2 + x}{3 - x} & \text{if } x \leq 1 \\
1 + 2x^3 & \text{if } 1 < x < 3 \\
4 & \text{if } x \geq 3 
\end{cases} \)

Find \( f(-1) \), \( f(2) \) and \( f(3) \).

\[ f(-1) = \frac{2 + (-1)}{3 - (-1)} = \frac{1}{4} \]

\[ f(2) = 1 + 2 \cdot 2^3 = 17 \]

\[ f(3) = 4 \]
(5) Find the domain of \( f(x) = \sqrt{x^2 - 5x - 6} \).

\[
\begin{align*}
x^2 - 5x - 6 & \geq 0 \quad \text{or} \quad (x-6)(x+1) \geq 0 \\
\text{So} \quad (x-6) \geq 0 \quad \text{and} \quad (x+1) \geq 0 & \implies x \geq 6 \\
\text{or} \quad x-6 \leq 0 \quad \text{and} \quad x+1 \leq 0 & \implies x \leq -1
\end{align*}
\]

Thus \( x \geq 6 \) or \( x \leq -1 \)

So \( D = \left\{ x \mid x \geq 6 \quad \text{or} \quad x \leq -1 \right\} \)

\( (6) \) Sketch the graph of \( f(x) = (x-1)^3 \).

\[
\begin{array}{c}
\text{Graph}
\end{array}
\]

(7) Factor \( a^3b - 4a^2b^2 - 21ab^3 \).

\[
a^3b - 4a^2b^2 - 21ab^3 = ab(a^2 - 4ab - 21b^2) = ab(a-7b)(a+3b)
\]

(8) Let \( f(x) = x^2 + 4x \) and \( g(x) = \sqrt{x+4} \).

(a) What is \( \frac{f(x)}{g(x)} \) in simplified form?

\[
\frac{f(x)}{g(x)} = \frac{x^2 + 4x}{\sqrt{x+4}} = \frac{x(x+4)}{\sqrt{x+4}} = x\sqrt{x+4} \quad \text{for} \quad x > -4
\]

(b) What is \( g(f(x)) \) in simplified form?

\[
g(f(x)) = \sqrt{x^2 + 4x + 4} = \sqrt{(x+2)^2} = |x+2|
\]
(9) John plans to make a rectangular enclosure for his horses with 200 yards of fencing. If \( x \) is the width of the enclosure, find a function for the area of the enclosure in terms of \( x \).

\[
2x + 2y = 200 \implies y = 100 - x
\]

\[
A = xy = x(100 - x)
\]
or
\[
\text{or } A(x) = x(100 - x)
\]

(10) Find the limits of the following if they exist:

(a) \( \lim_{x \to -2} \frac{x^2 + 2x}{x^2 - 4} = \lim_{x \to -2} \frac{(x + 2)x}{(x + 2)(x - 2)} = \lim_{x \to -2} \frac{x}{x - 2} = \frac{-2}{-4} = \frac{1}{2} \)

(b) If \( f(x) = \begin{cases} 3 - x & \text{if } x < 2 \\ \sqrt{x - 1} & \text{if } x \geq 2 \end{cases} \), then \( \lim_{x \to 2^{-}} f(x) = \lim_{x \to 2^{-}} \sqrt{x - 1} = \sqrt{1 - 1} = 1 \)

\[
= \lim_{x \to 2^{-}} 3 - x = 3 - 2 = 1
\]

\text{Since the left and right limits are the same.}

(c) \( \lim_{x \to 3} \frac{5 + x}{6 - 2x} \)

\text{Does not exist}

\text{Since the top approaches 8 but the bottom gets small (close to 0)}

(d) \( \lim_{x \to \infty} \frac{x^2 + 1}{3 - x} = \lim_{x \to \infty} \frac{(x^2 + 1)\frac{1}{x}}{(3 - x)\frac{1}{x}} = \lim_{x \to \infty} \frac{x + \frac{1}{x}}{\frac{3}{x} - 1} \)

\[
= \frac{1}{x} \to 0 \text{ so } \lim_{x \to \infty} \frac{x^2 + 1}{3 - x} = \lim_{x \to \infty} \frac{x}{\frac{3}{x} - 1} = \infty
\]

(e) \( \lim_{x \to \infty} \frac{7x + 1}{6 + 5x} = \lim_{x \to \infty} \frac{(7x + 1)(\frac{1}{x})}{(6 + 5x)(\frac{1}{x})} = \lim_{x \to \infty} \frac{7 + \frac{1}{x}}{\frac{6}{x} + 5} = \frac{7}{5} \)
(11) If \( \lim_{x \to 4} f(x) = 7 \) and \( \lim_{x \to 4} g(x) = -6 \), find the following:
(a) \( \lim_{x \to 4} f(x) - g(x) = 7 - (-6) = 13 \)

(b) \( \lim_{x \to 4} f(x)g(x) = 7(-6) = -42 \)

(12) Let \( f(x) = \begin{cases} 
10 & \text{if } x < -5 \\
-2x & \text{if } -5 \leq x < -2 \\
x^2 & \text{if } x > -2. 
\end{cases} \)
(a) Is \( f(x) \) continuous at \( x = -5 \)?
\[
\lim_{x \to -5} f(x) = 10 = \lim_{x \to -5} f(x) \\
\text{So } \lim_{x \to -5} f(x) = 10 \text{ and } f \text{ is continuous at } x = -5
\]
(b) Is \( f(x) \) continuous at \( x = -2 \)?
\[
f(-2) \text{ does not exist} \\
\text{So } f \text{ is not continuous at } x = -2
\]

(13) Find the derivative of \( f(x) = 2x^3 \).

\[
\begin{align*}
(1) \quad & f(x+h) = 2(x+h)^3 = 2x^3 + 4xh + 2h^2 \\
(2) \quad & f(x+h) - f(x) = 2x^3 + 4xh + 2h^2 - 2x^3 = 4xh + 2h^2 \\
(3) \quad & \frac{f(x+h) - f(x)}{h} = \frac{4xh + 2h^2}{h} = \frac{h(4x + 2h)}{h} = 4x + 2h \\
(4) \quad & \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} 4x + 2h = 4x \\
\text{So } & f'(x) = 4x
\end{align*}
\]
(14) The position of car A is given by \( s = f(t) \) and the position of car B is given by \( s = g(t) \).

(a) Which car is driving faster at \( t_1 \)?

The slope is steeper on the curve \( s = f(t) \) so Car A is faster at \( t_1 \).

(b) Which car is driving faster at \( t_2 \)?

The slope is steeper on the curve \( s = g(t) \) so Car B is faster at \( t_2 \).