1. Find the parametric equations for the line passing through the point \((4, -7)\) and perpendicular to the line \(3x + 4y = -8\).

2. \[
\lim_{t \to 4} \frac{t^2 - 16}{\sqrt{t} - 2}
\]

3. Consider the triangle with vertices \(A(1, 3), B(2, 1)\) and \(C(-2, 0)\). Find the angle \(\angle BAC\).
4. Find the distance from the point $P(5, 1)$ to the line $y = 2x - 1$.

5. Consider $f(x) = \begin{cases} \ ax^2 + 2x & \text{if } x < 2 \\ k & \text{if } x = 2 \\ x^3 + ax - 3 & \text{if } x > 2 \end{cases}$.
   For what values of $k$ and $a$ is $f(x)$ continuous?

6. Find the equation of tangent line to the curve $x^3 - 3xy + y^3 = 3$ at the point $(2, 1)$. 
7. Find the linear and quadratic approximation for \( f(x) = xe^{3x} \) at \( x = 0 \).

8. Find all point(s) on the curve \( x = t^3 - 3t - 1 \) and \( y = t^3 - 12t + 3 \) where the tangent line is vertical.

9. \( \lim_{x \to -\infty} \frac{2e^{-3x} - 3e^{3x}}{4e^{-3x} + 2e^{3x}} \).
10. For the equation $y = e^{2x} + e^{-3x}$, find $y'' + y' - 6y$.

11. If $f'(x) = 2\sin x + 4\cos x - e^x$ and $f(0) = 5$, what is $f(\pi)$?

12. $\lim_{x \to 0} \frac{2^{3x} - 5^x}{4x}$
13. Find the absolute extrema for \( f(x) = x^2 + \frac{2}{x} \) over the interval \( [\frac{1}{2}, 2] \).

14. If \( f(x) = \arctan(x^2 + 2x + 3) + \arccos(3x) \), find \( f'(0) \).

15. Give \( f(x) = 2xe^{3x} \), find the interval of increasing, decreasing, concavity, and find local extrema and inflection point(s).
16. \[ \lim_{n \to \infty} \sum_{i=1}^{n} \frac{1}{n} \left( \frac{i}{n} \right)^2 \]

17. Estimate the area under the graph of \( f(x) = x^3 + 2 \), \([-1, 2]\) using 6 approximating rectangles and left endpoints.

18. For the given function \( f(x) = x^3 + 2x \), set up the limit of Riemann Sum that represents the area under the graph of \( f(x) \) on the interval \([0, 2]\) using right endpoints.
19. Write as a single integral

\[ \int_{-3}^{5} f(x)dx - \int_{-3}^{0} f(x)dx + \int_{5}^{6} f(x)dx \]

20. Find the derivative of the given function.

(a) \( f(x) = \int_{1}^{x} (t^2 - 1)^{20} dt \)

(b) \( g(x) = \int_{x}^{2} \cos(t^2) dt \)

(c) \( y = \int_{25}^{\sin x} t \cos(t^3) dt \)
21. Evaluate the integrals.

(a) \( \int_{1}^{2} (5x^2 - 4x + 3) \, dx \)

(b) \( \int_{1}^{2} \frac{t^6 - t^2}{t^4} \, dt \)

(c) \( \int_{0}^{\frac{\pi}{2}} (\cos \theta + 2 \sin \theta) \, d\theta \)

(d) \( \int_{-\epsilon^2}^{-\epsilon} \frac{3}{x} \, dx \)

(e) \( \int_{-\pi}^{\pi} f(x) \, dx \) where \( f(x) = \begin{cases} x & \text{if } -\pi \leq x \leq 0 \\ \sin x & \text{if } 0 \leq x \leq \pi \end{cases} \)