1. Find \( \int \frac{3x^3 - 12x^2 + 17x - 3}{x^2 - 4x + 4} \, dx \). Show all your steps.
2. Find \( \int \frac{2x + 13}{x^2 + 8x + 17} \, dx \). Show all your steps.
3. Find \[ \int \frac{x^3}{\sqrt{25 - x^2}} \, dx. \] You may need a trig substitution at the start, and in the middle, it may help to use \( \sin^2 u = 1 - \cos^2 u \). Show all your steps.
4A. Let $f(x) = \sqrt{x^3} = x^{3/2}$. Find the second-degree Taylor polynomial $P_2(x)$ for $f$ at $x_0 = 16$. Show all your work, neatly organized.

4B. What does Taylor’s theorem give as the maximum possible error committed by $P_2$ on the interval [9,21]? (Find your “$K_3$” to four decimal places)

4C. On the interval [9,21], by graphing the difference between $f(x)$ and $P_2(x)$, what does the actual maximum error appear to be, and at what $x$ does it occur?
5A. Show that for $x \geq 3$, $\sqrt[3]{x^6 - 14x} > (1/2)x^2$.

5B. Use the inequality in 5A and the appropriate $p$-test comparison to decide if $\int_3^\infty \frac{dx}{\sqrt[3]{x^6 - 14x}}$ converges.
6A. Find \( \int \frac{\ln x}{\sqrt{x}} \, dx \). Show your steps.

6B. Explain why a graph of \( \frac{\ln x}{\sqrt{x}} \) suggests \( \int_{0}^{1} \frac{\ln x}{\sqrt{x}} \, dx \) is an improper integral. (Sketch your graph here).

6C. Decide if the integral in (6B) converges, and if so to what. Make a table which clearly supports your conclusion. Make sure your work shows “\( \lim_{x \to \ldots} \)” in all the appropriate places.
7A. Solve the initial value problem
\[ \frac{dy}{dt} = \frac{e^t}{2y + 6}, \]
y(0) = -5

Note: to solve for $y$ near the end of the problem, try completing the square. Then remember that $A^2 = B$ means $A = \pm \sqrt{B}$.

7B. Graph your solution on the interval $[-2, 2]$. Pick useful $y$-coordinates.