Math 109 HW4

Fall 2018

1. Evaluate the integral $\int \frac{1}{x^3\sqrt{x^2-4}}dx$.

2. Evaluate the integral $\int x^2\sqrt{1-x^6}dx$.

3. For question (a), (b), (c), write out the form of the partial fraction decomposition of the function (as in Example 7 in the textbook Page 499). Do not determine the numerical values of the coefficients.

(a). $\int \frac{3+x}{x(x^2+2x+1)}dx$.

(b). $\int \frac{2x+1}{(x^3+x^2+x)}dx$.

(c). $\int \frac{x^5+1}{x^2+x^4}dx$.

4. Evaluate the integral $\int \frac{x^2+1}{x^2-2x-3}dx$.

5. Evaluate the integral $\int_1^3 \frac{x^3+2x^2+x-1}{x^3+x}dx$.

6. Show that $\frac{1}{2}x\sin x$ is a solution to $y''+y=\cos x$.

7. Show that every member of the family of functions $y(x)=\frac{\ln x+C}{x}$ is a solution to $x^2y'+xy=1$.

8. $v(t)$ is a solution of the differential equation $v'=-v(v+1)(v-1)$. For what values of v, is v unchanging, increasing and decreasing? Explain your answer. We call the unchanging value of v is an equilibrium status.

9. a) $u(x)$ satisfies $\frac{du}{dx}=u-2x$. Use the direction field method to sketch a solution curve that passes the point $(1,0)$.

b) $u(x)$ satisfies $\frac{du}{dx}=xu+u$. Use the direction field method to sketch a solution curve that passes the point $(0,1)$.