Math 152 Week in Review: Sections 7.4, 7.8

Solutions and questions can be found at the link:
https://www.math.tamu.edu/~kahlig/152WIR.html

1. Give the partial fraction decomposition of these fractions. Do not solve for the constants.

   (a) $\dfrac{x^4}{x^3+5x^2+6x}$

   (b) $\dfrac{3x}{x(x-2)^3(x^2+9)^2}$

   (c) $\dfrac{x+1}{(x-2)(x^4-16)}$

2. $\displaystyle\int \frac{6x^2 + x + 4}{(x-2)(x^2+2)}\,dx$

3. $\displaystyle\int \frac{2x^3 - 5x^2 - 32}{x^2 - 4x}\, dx$

4. $\displaystyle\int \frac{x^3 - 4x^2 - 11x - 4}{(x+2)^2(x^2 - x)}\, dx$

5. $\displaystyle\int \frac{5x^3+8x^2+25x+72}{x(x^2+9)(x^2+4)}\,dx$

Determine if these integrals converge or diverge. if converge, then compute the value.

6. $\displaystyle\int_3^\infty \frac{x^2}{\sqrt[3]{x^3+1}}\,dx$

7. $\displaystyle\int_2^\infty 3xe^{-4x}\,dx$

8. $\displaystyle\int_0^5 \frac{5}{(x-2)^3}\,dx$

9. $\displaystyle\int_0^4 x\ln(x)\,dx$

Comparison Theorem

Suppose that f and g are continuous functions with $f(x) \geq g(x) \geq 0$ for $x \geq a$

(a) If $\int_a^\infty f(x)dx$ is convergent, then $\int_a^\infty g(x)dx$ is convergent.

(b) If $\int_a^\infty g(x)dx$ is divergent, then $\int_a^\infty f(x)dx$ is divergent.

Fact: The $\int_1^\infty \frac{1}{x^p}\, dx$ is convergent if $p > 1$ and diverges if $p \leq 1$.

10. Use the Comparison Theorem to determine if the integral converges or diverges

$$\int_2^\infty \frac{4\sin^2(x) + 1}{\sqrt{x}}\, dx$$

11. Use the Comparison Theorem to determine if the integral converges or diverges

$$\int_{2}^{\infty} \frac{3x}{x^2 + e^{4x}}\, dx$$