Name: ____

1. Fill in the blanks (short answers).

   (a) The improper integral $\int_0^\infty \frac{1}{x^p}\,dx$ converges if and only if

   _______________.

   (b) To evaluate an integral of the form $\int \sqrt{a^2+x^2}\,dx$ we make the trig substitution _______________.

   (c) Given an improper integral $\int_a^\infty f(x)\,dx$, if the limit $\lim_{t\to\infty}\int_a^t f(x)\,dx$ does not exist as a finite number we say that the integral _______________.

   (d) Given a rational expression $\frac{P(x)}{Q(x)}$, if the degree of P(x) is less than Q(x), then we say the rational expression is

   _______________.

2. Write out the form of the partial fraction decomposition of the fractions. Do not solve for the coefficients.

(a) $\dfrac{3x+9}{x^4-1}$

(b) $\dfrac{x^3+}{(x^2+1)(x+4)^3}$

3. Evaluate the following integrals:

(a) $\int \frac{dx}{\sqrt{x^2 + 25}}$

(b) $\int \frac{dx}{x^2 - 1}$

4. (a) Use Simpson's rule to estimate $\int_0^{2\pi} \cos x \, dx$ with $n = 4$.

(b) How large must we choose n to ensure that using Simpson's rule to estimate the integral in part (a) will be accurate to within 0.01?

5. Determine whether each integral converges or diverges. If it converges, evaluate it.

(a) $\int_{-\infty}^{0} \frac{1}{3x+4}\, dx$

(b) $\int_{0}^{1} \frac{3}{x^5}\, dx$

6. Find the arc length of the curve $y = \ln(\sec x)$ where $0 \leq x \leq \pi/4$.

7. Find the area of the surface obtained by rotating the curve $y = x^3$ about the $x-$axis where $0 \leq x \leq 2$.