Name: _____

TA's Name:

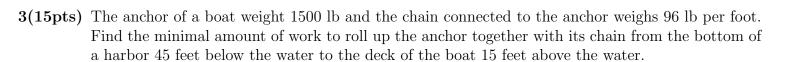
Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

 $1(20 \mathrm{pts})$ Find the following integrals.

(a)
$$\int x\sqrt{4+x^2} \ dx$$

(b)
$$\int x \sec^2 x \ dx$$

2(10pts) Determine if the improper integral converges or diverges:
$$\int_{1}^{\infty} \frac{\sqrt{x}+1}{2x^{2}-x+1} dx.$$



4(15pts) Find the partial fraction for the rational function
$$\frac{x+1}{x^4+x^3+x^2}$$
.

5(15pts) The base of a solid is a circle of radius a, and each of its cross section perpendicular to a line through the center of the circle is a square. Set up an integral for the volume of the solid but do not evaluate the integral even if it is simple.

6(15pts) For the following series, either prove it diverges or find its value.

(a)
$$\sum_{n=0}^{\infty} (-1)^{n+1} \frac{2^{n+2}}{3^{n+3}}$$

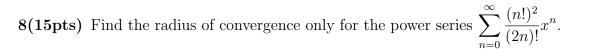
(b)
$$\sum_{n=1}^{\infty} \ln(1 + \frac{1}{n})$$

7(30pts) Determine if the following series absolutely converges, conditionally converges, or diverges.

(a)
$$\sum_{n=2}^{\infty} (-1)^n \frac{1}{\sqrt{n} \ln n}$$

(b)
$$\sum_{n=1}^{\infty} (-1)^n \left(1 - \frac{1}{n}\right)^n$$

(c)
$$\sum_{n=1}^{\infty} \frac{n \sin n + 1}{2n^{5/2} + \sqrt{n} + 10}$$



9(15pts) Write the integral $\int_0^1 \frac{\sin x^2}{x}$ as an infinite series and determine the number of terms needed in order to approximate the integral to the 4th decimal place.



| $12(20 \mathrm{pts})$ | (a) Find the angle between the x-axis and the position vector of the point $P(1, 1, 1)$. |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | (b) Find an equation of the plane containing the x -axis and the point P . |
| | |
| $13(10 \mathrm{pts})$ | A particle of mass m is accelerated by a force $\mathbf{F} = m\mathbf{a}$ with $\mathbf{a} = -(\mathbf{i} + \mathbf{j} + \mathbf{k})$ from the initial position $\mathbf{r}(0) = \mathbf{i} + \mathbf{j} + \mathbf{k}$ at rest. Find its position and velocity one unit time later. |
| | |
| 2 Bo | onus Points: Your TA's last name is: (The End) |