Name:_____

Math 166 Section 19061 *Practice Exam 2* *October 6, 2011*

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work or answer, you will receive little or no credit!

For problems 1 - 6, evaluate the integrals.

1. $\displaystyle\int \frac{1}{x^2+3x-4}\,dx$

2. $\displaystyle\int \frac{x^3-4x-10}{x^2-x-6}\,dx$

3. $\displaystyle\int \frac{x^2+8x-3}{x^3+3x^2}\,dx$

4. $\displaystyle\int \frac{e^{3x}}{1+e^{2x}}\,dx$

5. $\displaystyle\int x\sin^2 x\cos x\;dx$

6. $\displaystyle\int \frac{dx}{1+e^{x}}$

For problems 7 - 9, determine if the following integrals converge or diverge.

7. $\displaystyle\int_1^\infty \frac{\tan^{-1} x}{x^2}\, dx$

8. $\displaystyle\int_0^2 \frac{\ln x}{\sqrt{x}}\, dx$

9. $\displaystyle\int_0^1 \frac{dx}{\sqrt{1-x^2}}$

For problems 10 - 12, find the length of the given curves.

10. $y = \ln(\cos x)$ on $0 \leq x \leq \dfrac{\pi}{4}$

11. $y = \dfrac{1}{6}(x^2 + 4)^{3/2}$, on $0 \leq x \leq 3$

12. $y = 2(x + 4)^{3/2}$, on $0 \leq x \leq 2$

For problems 13 - 16, find the area of the surface obtained by rotating the given curve about the indicated axis.

13. $y = 1 - x^2$, on $0 \leq x \leq 1$ about the $y-$axis

14. $x = y^3$, on $1 \leq y \leq 2$ about the $y-$axis

15. $y = \dfrac{x^3}{6} + \dfrac{1}{2x}$, on $\dfrac{1}{2} \leq x \leq 1$ about the $x-$axis

16. Find the centroid of the region bounded by the curves $y = \sin x$, $y = 0$, $x = 0$, and $x = \pi$.

17. Find the centroid of the region bounded by $y = x$ and $y = \sqrt{x}$.

18. Let $x = e^t$ and $y = t^2 + \sin t$. Compute $\dfrac{dy}{dx}$.

19. Set up the integral that represents the length of the curve given by $x = e^t + e^{-t}$ and $y = \ln(1 + t^2)$ on $1 \leq t \leq 3$.

For problems 20 and 21, find a polar equation for the given curve represented by the Cartesian equation.

20. $x^2 - y^2 = 3xy$

21. $e^{x^2+y^2} = \dfrac{x}{y}$

22. Find the values of θ on $0 \leq \theta \leq 2\pi$ of the curve $r = \cos\theta$ for which the tangent line is horizontal.

23. Define a curve by the following

$$x = \int_1^t \frac{\cos u}{u}\, du \qquad \text{and} \qquad y = \int_1^t \frac{\sin u}{u}\, du\ .$$

Find the length of the curve on $1 \leq t \leq e$.

24. Define a curve by the following

$$x = \int_0^t \cos\left(\frac{\pi u^2}{2}\right)\, du \qquad \text{and} \qquad y = \int_0^t \sin\left(\frac{\pi u^2}{2}\right)\, du\ .$$

Find the length of the curve on $1 \leq t$. (Note the upper limit will be infinity.)