First Name: ..... Last Name: ..... ID: .....

Practice Final Exam with Solutions (Math 19B, Fall 2019)

Time: 3 hours.

No calculators, cellphones, notes or other tools allowed.

Maximal score: 60 points (Each problem 3 points)

1. Compute $\int(6e^t - \sec^2(t))dt$. $6e^t - \tan(t) + C$

2. Calculate the function $\int_x^{\pi/2} 3\sin(t)dt$ of x. $3\cos(x)$

3. Compute $\int_2^3 \frac{dx}{2x\ln(x)}$. $\frac{1}{2}\big(\ln(\ln(3)) - \ln(\ln(2))\big)$

4. Compute $\int_0^8 \frac{dx}{4x^2+16}$. $\frac{1}{8}\arctan(4)$

5. Compute the area of the region inclosed by the curves $y = x$ and $y = x^3$. $\frac{1}{2}$

6. Compute the volume of the solid obtained by rotating the region inclosed by the curves $y = x^2 - 4$ and $y = -x^2 + 4$ about the line $x = 5$. $\frac{640}{3}\pi$

7. Compute $\int x\cos(x)dx$. $x\sin(x) + \cos(x) + C$

8. Evaluate the integral $\int \frac{dx}{\sqrt{x^2+2x}}$. $-\ln|x + 1 - \sqrt{x^2+2x}|$

9. Evaluate the integral $\int \frac{9x-x^2+8}{(x-1)(x+1)^2}dx$. $4\ln|x-1| - 5\ln|x+1| - \frac{1}{x+1} + C$

10. First make a substitution then use integration by parts to compute $\int_1^4 9e^{\sqrt{x}}dx$. $18e^2$

11. Determine the value of the improper integral $\int_1^\infty \frac{dx}{x^2}$. 1

12. Compute the length of $y = \frac{x^2}{4} - \frac{\ln(x)}{2}$ over $[1, 2e]$. $e^2 + \frac{1}{4} + \frac{\ln(2)}{2}$

13. Compute the surface area of revolution of $y = 2x+1$ about the x-axis over $[1, 3]$. $20\sqrt{5}\pi$

14. Determine $\lim_{n\to\infty} \ln(\frac{2n^2+3}{n^2+5})$. $\ln(2)$

15. Determine $\frac{2^3}{5} + \frac{2^4}{5^2} + \frac{2^5}{5^3} + \cdots$. $\frac{8}{3}$

16. Does $\sum_{n=1}^\infty \frac{1}{n+2019}$ converge? No

17. Does $\sum_{n=1}^\infty \frac{(-1)^n}{n}$ converge? Yes

18. Does $\sum_{n=1}^\infty \frac{7^n+8^n}{9^n}$ converge? Yes

19. Find the interval of convergence of the power series $\sum_{n=0}^\infty \frac{x^n}{(n!)^2}$. $(-\infty, \infty)$

20. What is the MacLaurin series of $\sin(2x)$? $\sum_{n=0}^\infty (-1)^n \frac{2^{2n+1}}{(2n+1)!}x^{2n+1}$