Name________________________________

1-14	/49	16	/20
15	/15	17	/20
		Total	/104

MATH 172 Exam 1 Spring 2021

Sections 501 P. Yasskin

Multiple Choice: (Points indicated.)

1. (5 pts) Compute $\int_0^{\pi/4} x\cos(4x)\,dx$.

a. $-\frac{1}{8}$

b. $-\frac{1}{16}$

c. 0

d. $\frac{1}{16}$

e. $\frac{1}{8}$

2. (5 pts) Compute $\int_0^{\pi/4} \tan^{5/2}x\sec^2x\,dx$.

a. $\frac{2}{3}$

b. $\frac{2}{5}$

c. $\frac{2}{7}$

d. $\frac{2}{5}(2^{5/2}-1)$

e. $\frac{2}{7}(2^{5/2}-1)$

3. (1 pts) In computing the integral $\int_0^{\pi/4} \tan^{5/2}x\sec^2x\,dx$,
you used the formula (identity):

a. $\frac{d}{dx}\tan x = \sec^2 x$

b. $\frac{d}{dx}\sec x = \sec x\tan x$

c. $\tan^2 x + 1 = \sec^2 x$

d. $\int \tan x\,dx = -\ln|\cos x| + C$

e. $\int \sec x\,dx = \ln|\sec x + \tan x| + C$

4. (5 pts) Compute $\int \frac{3x^5}{\sqrt{x^3+8}}\,dx.$

a. $\frac{2(x^3+8)^{3/2}}{3} - 16(x^3+8)^{1/2} + C$

b. $\frac{2(x^3+8)^{5/2}}{5} - \frac{16(x^3+8)^{3/2}}{3} + C$

c. $\frac{2(x^3+8)^{3/2}}{3} + 16(x^3+8)^{1/2} + C$

d. $\frac{2(x^3+8)^{5/2}}{5} + \frac{16(x^3+8)^{3/2}}{3} + C$

e. $\frac{2u^{3/2}}{3} + 16u^{3/2} + C$

f. $\frac{2u^{5/2}}{5} + \frac{16u^{3/2}}{3} + C$

g. $\frac{2u^{3/2}}{3} + 16u^{3/2} + C$

h. $\frac{2u^{3/2}}{3} + 16u^{3/2} + C$

5. (5 pts) Compute $\int x^2 \ln|x|\,dx.$

a. $\frac{x^3}{3}\ln|x| + \frac{x^4}{12} + C$

b. $\frac{x^3}{3}\ln|x| - \frac{x^4}{12} + C$

c. $\frac{x^3}{3}\ln|x| + \frac{x^2}{6} + C$

d. $\frac{x^3}{3}\ln|x| - \frac{x^2}{6} + C$

e. $\frac{x^3}{3}\ln|x| + \frac{x^3}{9} + C$

f. $\frac{x^3}{3}\ln|x| - \frac{x^3}{9} + C$

6. (1 pts) In computing the integral $\int x^2 \ln|x|\,dx$, you used:

a. the substitution $u = x^2$

b. the substitution $u = \ln|x|$

c. integration by parts with $u = x^2$

d. integration by parts with $u = \ln|x|$

e. $\int \ln x\,dx = x\ln x - x + C$

f. $\int \ln x\,dx = x\ln x + x + C$

7. (5 pts) Let $A(x)$ be the area under the graph of the function $y = f(x)$ above the x-axis between $x = 2$ and a variable point x.
If $A(x) = x^4 - 16$, then $f(x) =$

a. 0

b. $\frac{x^5}{5} - 16x + \frac{128}{5}$

c. $4x^3 - 32$

d. $\frac{x^5}{5} - 16x$

e. $4x^3$

8. (5 pts) Compute $\int_0^1 \frac{1}{\sqrt{16x^2+9}}\,dx$

a. $\frac{1}{4}\ln 6$

b. $\frac{1}{2}\ln 6$

c. $\frac{1}{4}\ln 3$

d. $\frac{1}{2}\ln 3$

e. $2\ln 3$

9. (1 pts) In computing the integral $\int_0^1 \frac{1}{\sqrt{16x^2+9}}\,dx$, you used:

a. the substitution $x = \frac{4}{3}\tan\theta$

b. the substitution $x = \frac{4}{3}\sin\theta$

c. the substitution $x = \frac{4}{3}\sec\theta$

d. the substitution $x = \frac{3}{4}\tan\theta$

e. the substitution $x = \frac{3}{4}\sin\theta$

f. the substitution $x = \frac{3}{4}\sec\theta$

10. (1 pts) In computing the integral $\int_0^1 \frac{1}{\sqrt{16x^2+9}}\,dx$, you used the formula:

a. $\int \tan x\,dx = -\ln|\cos x| + C$

b. $\int \tan x\,dx = -\ln|\sin x| + C$

c. $\int \sec x\,dx = \ln|\sec x - \tan x| + C$

d. $\int \tan x\,dx = \ln|\cos x| + C$

e. $\int \tan x\,dx = \ln|\sin x| + C$

f. $\int \sec x\,dx = \ln|\sec x + \tan x| + C$

11. (5 pts) Find the length of the parametric curve $x = t^2$ and $y = \frac{1}{3}t^3 - t$ for $0 \le t \le 3$.

a. 3
b. 6
c. 9
d. 12
e. 16

12. (5 pts) The curve $y = \frac{e^x}{2} + \frac{1}{2e^x}$ for $0 \le x \le 1$ is rotated about the x-axis. Find the surface area swept out.

a. $\pi\left(\frac{e^2}{4} + \frac{3}{2} + \frac{1}{4e^2}\right)$
b. $\pi\left(\frac{e^2}{4} + \frac{1}{2} + \frac{1}{4e^2}\right)$
c. $\pi\left(\frac{e^2}{4} + 1 + \frac{1}{4e^2}\right)$
d. $\pi\left(\frac{e^2}{4} + \frac{3}{2} - \frac{1}{4e^2}\right)$
e. $\pi\left(\frac{e^2}{4} + \frac{1}{2} - \frac{1}{4e^2}\right)$
f. $\pi\left(\frac{e^2}{4} + 1 - \frac{1}{4e^2}\right)$

13. (5 pts) A rocket takes off from rest $(v(0) = 0)$ at 10 meters above the ground $(y(0) = 10)$ and has acceleration $a(t) = 6t + \sin t$. Find its height at $t = \pi$.

a. $\pi^3 + \pi + 9$
b. $\pi^3 + \pi + 10$
c. $\pi^3 + \pi + 11$
d. $\pi^3 - \pi + 9$
e. $\pi^3 - \pi + 10$
f. $\pi^3 - \pi + 11$

Work Out: (Points indicated. Part credit possible. Show all work.)

14. (15 pts) A bar between $x = 2$ and $x = 4$ has linear density $\delta = \dfrac{1}{x^3}$ g/cm.

a. Find the total mass of the bar.

b. Find the center of mass of the bar.

15. (20 pts) Compute $\int e^{2x} \sin 3x \, dx$.

The answer has the form $Ae^{2x} \sin 3x + Be^{2x} \cos 3x + C$.

Then

16. (20 pts) Compute $\int \dfrac{\sqrt{x^2 - 9}}{x} \, dx$.

The answer has the form $A(x^2 - 9)^{3/2} + B\sqrt{x^2 - 9} + C\operatorname{arcsec} \dfrac{x}{3} + K$.

Then