Name_____

MATH 172 Honors Exam 1 Spring 2020

Sections 200 P. Yasskin

Multiple Choice: (4 points each. No part credit.)

1. Compute $\int_0^{\pi/2} \cos^{3/2}x \sin x\, dx.$

a. 5

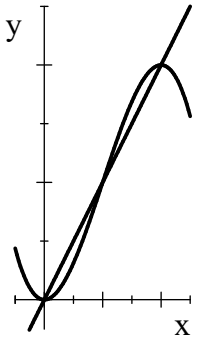
b. $\frac{5}{2}$

c. $\frac{4}{5}$

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

e. $\frac{1}{5}$

2. Find the total area between $y = 3x^2 - x^3$ and $y = 2x$.



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

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

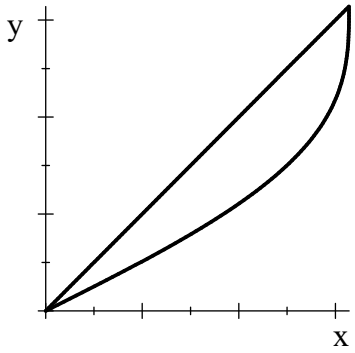
c. 1

d. 2

e. 0

1-14	/56	16	/18
15	/17	17	/15
		Total	/106

3. Find the area between $x = y + \sin y$ and $x = y$.



a. 2

b. 3

c. 4

d. $\frac{\pi}{2}$

e. π

4. Find the area between $y = 3x\sqrt{16 + x^2}$ and the x-axis for $0 \le x \le 3$

a. 244

b. 54

c. $3^{3/2}$

d. 9

e. 61

5. Compute $\int_0^1 2xe^{2x}\,dx$.

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

b. $\frac{1}{2}e^2$

c. $\frac{1}{2}(e^2 + 1)$

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

e. $\frac{1}{2}(3e^2 - 1)$

6. Find the average value of the function $f(x) = \sin x$ on the interval $[0, \pi]$.

a. 2
b. π
c. 2π
d. $\frac{2}{\pi}$
e. $\frac{1}{\pi}$

7. Find the length of the parametric curve $x = \theta$ and $y = \ln(\cos\theta)$ for $0 \le \theta \le \frac{\pi}{4}$.

a. $\ln\left|\sqrt{2} - 1\right|$
b. $\ln\left|\sqrt{2} + 1\right|$
c. $\ln\left|\sqrt{2} + 1\right| + 1$
d. $\ln\left|\sqrt{2} - 1\right| + 1$
e. $\ln\left|\sqrt{2} + 1\right| - 1$

8. The curve $(x, y) = \left(t + 1, \frac{t^2}{2} + t\right)$ for $0 \le t \le 1$ is rotated about the y-axis. Find the surface area.

a. $\frac{2\pi}{3}$
b. $\frac{8\pi}{3} 5^{3/2}$
c. $\frac{8\pi}{3}(5^{3/2} - 1)$
d. $\frac{8\pi}{3}(5^{3/2} - 2^{3/2})$
e. $\frac{2\pi}{3}(5^{3/2} - 2^{3/2})$

9. Compute $\int_1^2 x^3 \ln x \, dx$.

a. $4\ln 2 - \frac{15}{16}$

b. $4\ln 2 - \frac{17}{16}$

c. $2\ln 2 - \frac{7}{8}$

d. $2\ln 2 - \frac{9}{8}$

e. $2\ln 2 - \frac{15}{16}$

10. Compute $\int_{\pi/4}^{\pi/3} \tan^3\theta \sec^2\theta \, d\theta$.

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

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

c. 2

d. 4

e. 20

11. Compute $\int_0^{\pi} \cos^4\theta \, d\theta$.

a. $\frac{5\pi}{8}$

b. $\frac{3\pi}{8}$

c. $\frac{3\pi}{4}$

d. $\frac{3\pi}{16}$

e. $\frac{5\pi}{16}$

12. Compute $\int \frac{1}{(4-x^2)^{3/2}}\,dx$

a. $\frac{\sqrt{4-x^2}}{4x}+C$

b. $\frac{\sqrt{4-x^2}}{2x}+C$

c. $\frac{1}{4\sqrt{4-x^2}}+C$

d. $\frac{x}{4\sqrt{4-x^2}}+C$

e. $\frac{1}{2\sqrt{4-x^2}}+C$

13. Compute $\int 9x^2\cos(3x)\,dx.$

a. $3x^2\sin(3x)+2x\cos(3x)-\frac{2}{3}\sin(3x)+C$

b. $3x^2\sin(3x)-2x\cos(3x)+\frac{2}{3}\sin(3x)+C$

c. $3x^2\sin(3x)+2x\cos(3x)+\frac{2}{3}\sin(3x)+C$

d. $3x^2\sin(3x)-2x\cos(3x)-\frac{2}{3}\sin(3x)+C$

14. Compute $\int \frac{1}{x^2\sqrt{x^2-4}}\,dx$.

a. $\frac{1}{8}\sqrt{x^2-4}+C$

b. $\frac{x}{4}\sqrt{x^2-4}+C$

c. $\frac{1}{8x}\sqrt{x^2-4}+C$

d. $\frac{x}{8}\sqrt{x^2-4}+C$

e. $\frac{1}{4x}\sqrt{x^2-4}+C$

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

15. $(17$ points$)$ A bar between $x=1$ and $x=9$ has linear density $\delta=\frac{1}{\sqrt{x}}$ g/cm.

a. Find the total mass of the bar.

b. Find the center of mass of the bar.

16. (18 points) Compute $\int e^{4x}\cos 3x\,dx$.

17. $(15$ points$)$ A rocket takes off from rest (initial vertical velocity $V(0) = 0$) at the ground (initial height $y(0) = 0$) and has vertical acceleration $A = 40t\cos t$. Find its height at $t = \frac{\pi}{2}$.

HINT: Don't get confused between the rocket velocity V and the integration by parts v.