Name ______________________________ Sec______________

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MATH 152 FINAL EXAM Spring 2012

Sections 531-533 Version B P. Yasskin

1-15	/60
16	/12
17	/12
18	/12
19	/12
Total	/108

Multiple Choice: (15 questions, 4 points each)

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

a. $\frac{1}{2}+\frac{1}{2}\ln 2$

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

c. $\frac{1}{2}\ln 2-\frac{1}{2}$

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

e. Divergent

2. Compute $\int_0^{\pi/4} \cos\theta\sin^3\theta\,d\theta$

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

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

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

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

e. $\frac{1}{32}$

3. The partial fraction decomposition of $\frac{1}{x^2-x}$ is

a. $\frac{1}{x-1}+\frac{1}{x}$

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

c. $\frac{1}{x}-\frac{1}{x-1}$

d. $\frac{1}{x}+\frac{1}{x+1}$

e. $\frac{1}{x+1}-\frac{1}{x}$

4. Find the average value of $f(x) = \cos x$ on the interval $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$.

a. $\frac{2\sqrt{2}}{\pi}$

b. $\frac{\sqrt{2}}{\pi}$

c. $\sqrt{2}$

d. $\frac{1}{\sqrt{2}}$

e. $\frac{\pi}{\sqrt{2}}$

5. The region bounded by $x = 0$, $x = \cos y$, $y = 0$, $y = \frac{\pi}{4}$ is rotated about the x-axis. Which integral gives the volume of the solid of revolution?

a. $\int_0^{\pi/4} 2\pi \cos^2 y \, dy$

b. $\int_0^{\sqrt{2}/2} 2\pi x \arccos x \, dx$

c. $\int_0^{\pi/4} 2\pi y \cos y \, dy$

d. $\int_0^{\sqrt{2}/2} \pi(\cos^2 x - x^2) \, dx$

e. $\int_0^{\pi/4} 2\pi y^2 \, dy$

6. The base of a solid is the semi-circle between $y = \sqrt{9 - x^2}$ and the x-axis.
The cross sections perpendicular to the x-axis are squares. Find the volume of the solid.

a. $\frac{9}{2}\pi$

b. 9π

c. 9

d. 18

e. 36

7. $\sum_{n=2}^{\infty} \frac{3^n}{4^{n-1}} =$

a. $\frac{9}{7}$

b. 4

c. 9

d. 3

e. Diverges

8. As n approaches infinity, the sequence $a_n = \frac{1 - \cos n}{n^2}$

a. converges to $-\frac{1}{2}$

b. converges to 0

c. converges to $\frac{1}{2}$

d. converges to 1

e. diverges

9. If $g(x) = \cos(x^2)$, what is $g^{(8)}(0)$, the 8th derivative at zero?
HINT: What is the coefficient of x^8 in the Maclaurin series for $\cos(x^2)$?

a. $\frac{1}{8 \cdot 7 \cdot 6 \cdot 5}$

b. $4!$

c. $\frac{1}{4!}$

d. $8 \cdot 7 \cdot 6 \cdot 5$

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

10. Compute $\sum_{n=1}^{\infty}\left(\frac{n}{n+1}-\frac{n+1}{n+2}\right)$

a. $-\frac{1}{2}$

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

c. 1

d. 2

e. Divergent

11. Compute $\lim_{x\to 0}\frac{\sin(2x)-2x}{3x^3}$

a. $-\frac{1}{9}$

b. -4

c. $-\frac{8}{9}$

d. $-\frac{4}{3}$

e. $-\frac{4}{9}$

12. Estimate $\int_0^{0.1}\sin(x^2)\,dx$ to within an error of $|E| < 0.0001$, HINT: Use a Maclaurin series.

a. $0.1-\frac{(0.1)^3}{6}$

b. 0.1

c. $(0.1)^2-\frac{(0.1)^6}{6}$

d. $\frac{(0.1)^3}{3}$

e. $(0.1)^2$

13. If $\vec{u}$ points North and $\vec{v}$ points South-East, then $\vec{u} \times \vec{v}$ points

- **a**. Up
- **b**. Down
- **c**. East-North-East
- **d**. West-South-West
- **e**. North-West

14. Find the area of a triangle with edges $\vec{a} = (3,-2,1)$ and $\vec{b} = (-1,0,1)$.

- **a**. 1
- **b**. 2
- **c**. $\sqrt{6}$
- **d**. 6
- **e**. $2\sqrt{6}$

15. A vector $\vec{u}$ has length 5. A vector $\vec{v}$ has length 4. The angle between them is $60°$. Find $\vec{u} \cdot \vec{v}$.

- **a**. 10
- **b**. $\frac{1}{40}$
- **c**. $\frac{\sqrt{3}}{40}$
- **d**. 40
- **e**. $10\sqrt{3}$

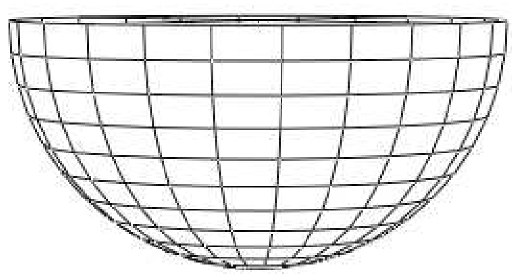
Work Out (4 questions, 12 points each)
Show all you work.

16. (12 points) Find the arc length of the curve $y = \frac{x^2}{4} - \frac{\ln x}{2}$ between $x = 1$ and $x = e$.

17. (12 points) Find the work done to pump the water out the top of a hemispherical bowl of radius 5 cm if it is filled to the top.

The density of water is $\rho = 1 \ \frac{\text{gm}}{\text{cm}^3}$.

The acceleration of gravity is $g = 980 \ \frac{\text{cm}}{\text{sec}^2}$.



18. (12 points) Compute $\int_{3}^{3\sqrt{2}} \frac{\sqrt{x^2-9}}{x}\,dx$.

19. (12 points) Find the radius and interval of convergence of $\sum_{n=2}^{\infty} \frac{(x-3)^n}{4\ln n}$. Be sure to check the endpoints. Name or state any test you use and check the conditions.

Radius: $R =$ ______________

Interval: ______________