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1-12	/60
13	/12
14	/12
15	/12
16	/12

MATH 152 FINAL EXAM Spring 2005

Sections 513,514 Version B1 P. Yasskin

Multiple Choice: (5 points each)

1. Find the area between the curves $y = x^2$ and $y = 2x + 3$.

a. $\frac{4}{3}$
b. $\frac{8}{3}$
c. $\frac{16}{3}$
d. $\frac{32}{3}$
e. $\frac{88}{3}$

2. The base of a solid is the circle $x^2 + y^2 = 9$ and the cross sections perpendicular to the x-axis are squares. Find the volume of the solid.

a. 9
b. 18
c. 36
d. 72
e. 144

3. Using a trigonometric substitution, the integral $\int \frac{dx}{x^2\sqrt{16+x^2}}$ becomes

a. $\int \frac{\cos^3\theta}{16\sin^2\theta}\,d\theta$
b. $\int \frac{\cos^3\theta}{64\sin^2\theta}\,d\theta$
c. $\int \frac{\cos\theta}{16\sin^2\theta}\,d\theta$
d. $\int \frac{1}{64\sin^2\theta\cos\theta}\,d\theta$
e. $\int \frac{1}{16\sin^2\theta\cos\theta}\,d\theta$

4. Compute $\int \frac{2}{x(x-2)}\,dx$.

a. $\ln|x-2| - \ln|x| + C$
b. $\ln|x| - \ln|x-2| + C$
c. $\ln|x| + 2\ln|x-2| + C$
d. $\ln|x| - 2\ln|x-2| + C$
e. $2\ln|x-2| - \ln|x| + C$

5. Use the Middle Sum Rule with $n = 4$ intervals to approximate the integral $\int_1^9 (9 + x^2)\,dx$.

a. 240
b. 312
c. $314\frac{1}{3}$
d. 320
e. 400

6. Solve the differential equation $\frac{dy}{dx} = \frac{4}{3}\frac{x^3}{y^2}$ with the initial condition $y(0) = 2$.

a. $y = 2x^{4/3}$
b. $y = x^{3/4} + 2$
c. $y = x^{4/3} + 2$
d. $y = \sqrt[4]{x^3 + 8}$
e. $y = \sqrt[3]{x^4 + 8}$

7. A sequence $\{a_n\}$ is defined by $a_1 = 4$ and $a_{n+1} = \sqrt{5a_n{}^2 - 16}$. Find $\lim\limits_{n\to\infty} a_n$.

a. -2
b. 2
c. $\sqrt{5}$
d. 4
e. Divergent

8. Compute $\displaystyle\sum_{n=1}^{\infty} \frac{2^{3n+1}}{3^{2n+1}}$

a. $\frac{2}{3}$
b. $\frac{8}{9}$
c. $\frac{16}{3}$
d. $\frac{16}{9}$
e. Divergent

9. Compute $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{(2n)!}$

HINT: Think about the standard Maclaurin series.

a. -1
b. 1
c. 2π
d. e^{π}
e. Divergent

10. A triangle has vertices $A = \left(2+\sqrt{2}, 3, 3\right)$, $B = (2, -1, -1)$ and $C = (2, 2, 2)$.
Find the angle at vertex C.

a. $\frac{\pi}{4}$
b. $\frac{\pi}{3}$
c. $\frac{\pi}{2}$
d. $\frac{3\pi}{4}$
e. $\frac{2\pi}{3}$

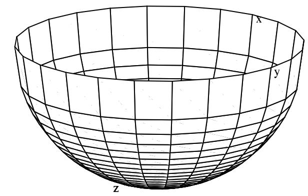
11. If $\vec{u}$ points Up and $\vec{v}$ points North-West, which way does $\vec{u} \times \vec{v}$ point?

a. South-West
b. South-East
c. North-East
d. $45°$ Up from North-West
e. $45°$ Down from North-West

12. Find the area of a parallelogram with edges $\vec{a} = (-2, 4, -1)$ and $\vec{b} = (3, 0, 2)$.

a. 8
b. $\sqrt{209}$
c. 209
d. $2\sqrt{2}$
e. $\frac{1}{2}\sqrt{209}$

13. (12 points) A water tank has the shape of a hemisphere with radius 5 m. It is filled with water to a height of 3 m. Find the work in Joules required to empty the tank by pumping all of the water to the top of the tank.
Give your answer in terms of ρ (the density of water) and g (the acceleration of gravity).



14. (12 points) Compute $\int_0^{\pi/4} \sec^3\theta \tan^3\theta \, d\theta$.

15. $\left(12 \text{ points}\right)$ The curve $y = \frac{x^2}{4} - \frac{\ln x}{2}$ between $x = 1$ and $x = 2$ is rotated about the y-axis. Find the area of the resulting surface.

16. $\left(12 \text{ points}\right)$ Find the Maclaurin series (using $\sum$ notation) for $f(x) = \frac{2x}{(1-2x)^2}$ by manipulating the derivative of the series for $g(x) = \frac{1}{1-2x}$. What is the interval of convergence for $f(x)$ (including endpoints)? Justify your answers.