NAME _____

STUDENT ID _____

REC. INSTR. _____ REC. TIME _____

INSTRUCTIONS:

1. Verify that you have all the pages (there are 5 pages).
2. Fill in your name, your student ID number, and your recitation instructor's name and recitation time above. Write your name, your student ID number and division and section number of your recitation section on your answer sheet, and fill in the corresponding circles.
3. Mark the letter of your response for each question on the mark–sense answer sheet.
4. There are 14 problems worth 7 points each.
5. No books or notes or calculators may be used.

$$\int \sec(x)\,dx = \ln|\sec(x)+\tan(x)| + C$$

$$\sin^2 x = \frac{1-\cos(2x)}{2} \qquad \cos^2 x = \frac{1+\cos(2x)}{2}$$

$$\sin(2x) = 2\sin x \cos x \qquad 1+\tan^2 x = \sec^2 x$$

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1. The equation $x^2+y^2+z^2-x+4y+1=0$ describes a sphere with center at

   A. $(1,1,1)$
   B. $(-1,4,1)$
   C. $(-1,4,0)$
   D. $(-\frac{1}{2},2,0)$
   E. $(\frac{1}{2},-2,0)$

2. Find a vector of length 2 and of the same direction as $\mathbf{i}-2\mathbf{j}+2\mathbf{k}$.

   A. $2\mathbf{i}-2\mathbf{j}+2\mathbf{k}$
   B. $\frac{1}{5}\mathbf{i}-\frac{2}{5}\mathbf{j}+\frac{2}{5}\mathbf{k}$
   C. $\frac{2}{3}\mathbf{i}-\frac{4}{3}\mathbf{j}+\frac{4}{3}\mathbf{k}$
   D. $2\mathbf{i}-4\mathbf{j}+4\mathbf{k}$
   E. $-2\mathbf{i}+4\mathbf{j}-4\mathbf{k}$

3. Consider two forces, one of 2 lb. in the direction East, the other of $\sqrt{2}$ lb in the direction Northwest. Their resultant will point precisely

   A. East

   B. Northeast

   C. North

   D. Northwest

   E. None of the above

4. The angle between the vectors $\mathbf{i}+\mathbf{j}$ and $\mathbf{j}+\mathbf{k}$ is

   A. 0

   B. $\frac{\pi}{4}$

   C. $\frac{\pi}{3}$

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

   E. π

5. The volume of a parallelepiped with one vertex at $(0,0,0)$ and adjacent vertices at $(1,1,0)$, $(2,1,0)$, $(1,1,4)$ is

   A. 4

   B. 3

   C. -3

   D. -4

   E. 6

6. $\lim_{x\to 0} \dfrac{1-\cos 2x}{x \sin x} =$

A. -1

B. 0

C. 1

D. ∞

E. 2

7. $\lim_{x\to 0^+} x^x =$

A. 0

B. 1

C. e

D. ∞

E. -1

8. $\int 2x \ln(x^2) dx =$

A. $\ln(x^2) + C$

B. $x^2 \ln(x^2) + C$

C. $x^2 \ln(x) + C$

D. $x^2(\ln(x) + 1) + C$

E. $x^2(2\ln(x) - 1) + C$

9. $\displaystyle\int_0^{\frac{\pi}{2}} \sin^3 x \cos^3 x \, dx =$

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

B. $\frac{1}{12}$

C. $\frac{1}{3}$

D. $\frac{1}{6}$

E. $\frac{1}{24}$

10. $\displaystyle\int \tan^3 x \sec^5 x \, dx =$

A. $\frac{1}{5}\sec^5 x - \frac{1}{3}\sec^3 x + C$

B. $\frac{1}{7}\sec^7 x + \frac{1}{5}\tan^5 x + C$

C. $\frac{1}{7}\sec^7 x + \frac{1}{5}\sec^5 x + C$

D. $\frac{1}{7}\sec^7 x - \frac{1}{5}\sec^5 x + C$

E. $\frac{1}{5}\tan^5 x + \frac{1}{3}\tan^3 x + C$

11. $\displaystyle\int_0^5 \sqrt{25 - x^2}\, dx =$

A. $\frac{25}{4}\pi$

B. 25π

C. $\frac{5}{4}\pi$

D. $\frac{5}{2}\pi$

E. 0

12. In order to compute $\displaystyle\int \frac{1}{\sqrt{9x^2+4}}dx$, which of the substitutions would be most effective?

A. $x = \frac{2}{3}\sin\theta$

B. $x = \frac{2}{3}\sec\theta$

C. $x = \frac{2}{3}\tan\theta$

D. $x = \frac{3}{2}\tan\theta$

E. $x = \frac{3}{2}\sec\theta$

13. Find the form of partial fraction expansion of $\dfrac{x+1}{(x^2+1)(x^3-x^2)}$

A. $\dfrac{A}{x^2+1} + \dfrac{B}{x-1} + \dfrac{Cx+D}{x^2}$

B. $\dfrac{Ax+B}{x^2+1} + \dfrac{C}{x-1} + \dfrac{D}{x} + \dfrac{E}{x^2}$

C. $\dfrac{Ax+B}{x^2+1} + \dfrac{C}{x-1} + \dfrac{D}{x^2}$

D. $\dfrac{A}{x^2+1} + \dfrac{B}{x-1} + \dfrac{C}{x^2}$

E. $\dfrac{Ax+B}{x^2+1} + \dfrac{C}{x-1} + \dfrac{D}{x}$

14. $\displaystyle\int_0^1 \frac{x+5}{x^2-2x-3}\,dx =$

A. $\ln 2 - 2\ln 3$

B. $\ln 2 + \ln 3$

C. $3\ln 2$

D. $2\ln 3$

E. $\ln 2 \ln 3$