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1-10	/60
11	/10
12	/10
13	/10
14	/10

MATH 172 EXAM 2 Spring 1999

Section 504 P. Yasskin

Multiple Choice: (6 points each)

1. Approximate $\int_1^7 (x^2 + 2x)\ dx$ by using the trapezoid rule with 3 intervals.

a. 83
b. 116
c. 162
d. 166
e. 232

2. Given that the partial fraction expansion for $\frac{x^2-1}{x^4+x^2}$ is $\frac{x^2-1}{x^4+x^2} = \frac{2}{x^2+1} - \frac{1}{x^2}$, compute $\int \frac{x^2-1}{x^4+x^2}\,dx$.

a. $2\tan^{-1}x + \frac{1}{x} + C$

b. $\tan^{-1}\left(\frac{x}{2}\right) + \frac{1}{x} + C$

c. $\tan^{-1}\left(\frac{x}{2}\right) - \frac{1}{x} + C$

d. $\frac{-4x}{(x^2+1)^2} + \frac{2}{x^3} + C$

e. None of These

3. Compute: $\int_1^2 \frac{1}{\sqrt{x^2-1}}\,dx$

a. $\sin^{-1}(2) - \frac{\pi}{2}$

b. $\frac{\pi}{2} - \sin^{-1}(2)$

c. $\ln\left(2+\sqrt{3}\right)$

d. $\ln\left(2-\sqrt{3}\right)$

e. $\ln\left(\frac{\sec 2 + \tan 2}{\sec 1 + \tan 1}\right)$

4. The improper integral $\int_1^2 \frac{1}{(x-1)^2}\,dx$

a. diverges to $-\infty$

b. converges to a negative number

c. converges to 0

d. converges to a positive number

e. diverges to $+\infty$

5. The improper integral $\int_2^\infty \frac{1}{x^2+1+\sin x}\,dx$

a. diverges to $-\infty$

b. converges and is $< \frac{1}{2}$

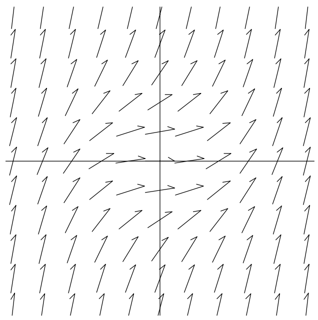
c. converges and is $= \frac{1}{2}$

d. converges and is $> \frac{1}{2}$

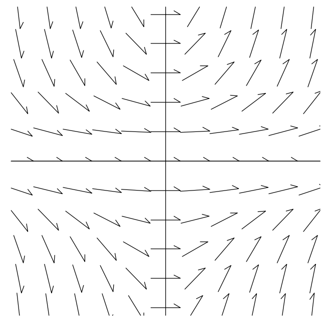
e. diverges to $+\infty$

6. Which of the following is the direction field of the differential equation $\frac{dy}{dx} = xy^2$?

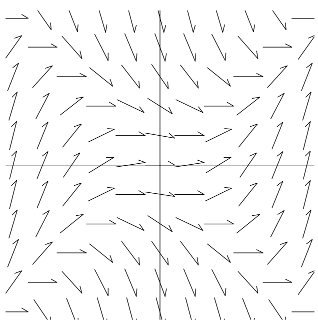
a.



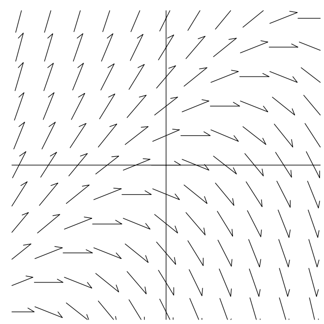
d.



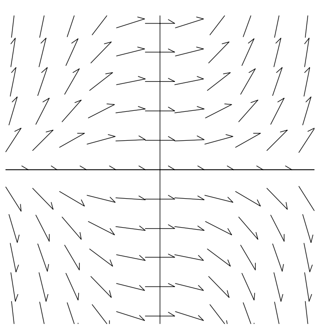
b.



e.



c.



7. Solve the initial value problem $\frac{dy}{dx} = xy^2$ with the initial condition $y(1) = \frac{2}{5}$. Then find $y(2)$.

a. 0
b. $\frac{1}{5}$
c. $\frac{4}{5}$
d. $\frac{7}{10}$
e. 1

8. The mass density of a 3 ft bar is $\rho = 1 + x^2 \, \frac{\text{lb}}{\text{ft}}$ for $0 \le x \le 3$. Find the center of mass of the bar.

a. $\bar{x} = 12$
b. $\bar{x} = \frac{16}{33}$
c. $\bar{x} = \frac{33}{16}$
d. $\bar{x} = \frac{4}{99}$
e. $\bar{x} = \frac{99}{4}$

9. Find the arc length of the parametric curve $x = 2t^2$ and $y = t^3 + 3$ between $t = 0$ and $t = 1$.

a. $\frac{61}{27}$

b. $\frac{125}{9}$

c. $\frac{125}{27}$

d. $\frac{122}{3}$

e. $\frac{250}{3}$

10. The curve $y = x^3$ for $0 \le x \le 2$ is rotated about the x-axis. The area of the resulting surface may be computed from the integral

a. $\int_0^2 \pi x\sqrt{1 + 9x^4}\,dx$

b. $\int_0^2 2\pi x^3\sqrt{1 + 9x^4}\,dx$

c. $\int_0^2 2\pi x\sqrt{1 + x^6}\,dx$

d. $\int_0^2 \pi x^3\sqrt{1 + x^6}\,dx$

e. $\int_0^2 2\pi x\sqrt{1 + 9x^4}\,dx$

11. (10 points) Find the partial fraction expansion for $\dfrac{2x^2 - x + 2}{x^3 + x}$.
(Do not integrate. HINT: Try $x = 0, 1, -1$.)

12. (10 points) Compute: $\displaystyle\int \frac{1}{(1 - x^2)^{3/2}}\, dx$.

13. (10 points) Solve the initial value problem $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{3x^2}{1+x^2}$ with the initial condition $y(1) = 2$.

14. (10 points) A nuclear power plant went on line at the beginning of the year 1980. It has produced isotope X at the rate of $10\ \frac{\text{kg}}{\text{yr}}$ and the half-life of X is 20 yr. (So its decay constant is $k = \frac{\ln 2}{20}$.) The plant stores all of the isotope X it produces. If there was no isotope X at the beginning of 1980, how much isotope X will there be at the beginning of the year 2000? (6 points for the equations.)