

Record your answers to the multiple choice problems by placing an \times through one letter for each problem on this page. There are 8 multiple choice questions worth 6 points each and 4 partial credit problems worth 10 points each. You start with 12 points. On the partial credit problems try to simplify your answer and indicate your final answer clearly. *You must show your work and all important steps to receive credit.*

You may not use a calculator.

1. a b c d e

2. a b c d e

3. a b c d e

4. a b c d e

5. a b c d e

6. a b c d e

7. a b c d e

8. a b c d e

Record your answers to the multiple choice problems by placing an \times through one letter for each problem on this page. There are 8 multiple choice questions worth 6 points each and 4 partial credit problems worth 10 points each. You start with 12 points. On the partial credit problems try to simplify your answer and indicate your final answer clearly. *You must show your work and all important steps to receive credit.*

You may not use a calculator.

1. a b c d e

2. a b c d e

3. a b c d e

4. a b c d e

5. a b c d e

6. a b c d e

7. a b c d e

8. a b c d e

1. Determine which of the following gives the area of the surface obtained by revolving the curve $y = 1/x$, $1 \leq x \leq 2$, about the y -axis.

(a) $2\pi \int_1^2 \frac{\sqrt{x^4 + 1}}{x} dx$

(b) $2\pi \int_1^2 \sqrt{x^4 + 1} dx$

(c) $2\pi \int_1^2 x\sqrt{x^2 + 1} dx$

(d) $2\pi \int_1^2 \frac{\sqrt{x^4 + 1}}{x^3} dx$

(e) $2\pi \int_1^2 \frac{\sqrt{x^2 + 1}}{x^2} dx$

2. For what value(s) of r does the function $y = e^{rt}$ satisfy the differential equation $y'' + 9y' + 18y = 0$.

(a) $0, -10$

(b) -2

(c) $-6, -3$

(d) $-9, -2$

(e) $-1/10$

3. A tank contains 100 gallons of salt water. Fresh water is added to the tank at the rate of 20 gallons per hour and the well-stirred mixture is drained at the same rate. After 5 hours the tank contains 1 pound of salt. Determine how many pounds of salt were in the tank originally.

(a) $e^{-1/20}$

(b) $1/e$

(c) $e^{1/5}$

(d) $1/e^5$

(e) e

4. Evaluate $\int_0^3 \frac{1}{x^2 - 2x + 1} dx$

(a) 0

(b) $-3/2$

(c) *diverges*

(d) $3/2$

(e) $1/2$

5. Evaluate $\int_0^1 \frac{x}{x^2 + 2x + 2} dx$.

- (a) *diverges* (b) $\ln(3)/2 + \pi/4$
(c) $\ln(5)/2 - 2 \tan^{-1}(2)$ (d) $(\ln(5) - \ln(2))/2$
(e) $(\ln(5) - \ln(2))/2 - \tan^{-1}(2) + \pi/4$

6. Compute the length of the curve $y = 2x^{3/2}$, $0 \leq x \leq 1$.

- (a) $2(10\sqrt{10} - 1)/27$ (b) $\sqrt{13}/12$ (c) $(13\sqrt{13} - 1)/12$
(d) $\sqrt{10}/27$ (e) $26/9$

7. Find the y -coordinate of the centroid of the region in the first quadrant bounded by the curves $y = 1 - x^2$, $y = 0$, and $x = 0$.

- (a) .3 (b) .45 (c) .33 (d) .25 (e) .4

8. Suppose that we use the Midpoint Rule with n subdivisions to estimate the integral $\int_0^1 \sin(x^2) dx$. Using the Error Bounds for the Midpoint Rule, determine how large n needs to be to guarantee an error less than E .

- (a) $2\sqrt{E}$ (b) $2/\sqrt{E}$ (c) $1/(4\sqrt{E})$ (d) $1/\sqrt{E}$ (e) $1/(2\sqrt{E})$

9. Find the form of the partial fraction decomposition of $\frac{x^7 + 1}{x^7 - 4x^3}$. (Do not solve for the constants.)
10. Evaluate the indefinite integral $\int \frac{\sqrt{1+x}}{x} dx$.
11. Determine whether $\int_0^\infty \frac{x \tan^{-1}(x)}{\sqrt{1+x^6}} dx$ converges.
12. A curve passes through the point $(0, -10)$ and has the property that the slope of the curve at every point P is equal to the reciprocal of the y -coordinate of P . Find the equation of the curve by deriving an appropriate differential equation with initial condition and solving it.