

Record your answers to the multiple choice problems by placing an \times through one letter for each problem on this page. There are 12 multiple choice questions worth 7 points each. You start with 16 points.

You may not use a calculator.

1. a b c d e2. a b c d e3. a b c d e4. a b c d e5. a b c d e6. a b c d e7. a b c d e8. a b c d e9. a b c d e10. a b c d e11. a b c d e12. 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 12 multiple choice questions worth 7 points each. You start with 16 points.

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

9. a b c d e

10. a b c d e

11. a b c d e

12. a b c d e

1. Use integration by parts to evaluate $\int x \tan^{-1}(x) dx$.

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

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

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

(d) $\frac{x}{1+x^2} - \tan^{-1}(x) + C$

(e) $\frac{1}{2}x^2 + \tan^{-1}(x) + C$

2. Integrate $\int_0^\pi \sin^3(x) dx$.

(a) $4/3$

(b) 1

(c) $1/4$

(d) $1/3$

(e) 0

3. Find the largest interval around $x = 0$ where the function $f(x) = x + 2 \sin(x)$ is one-to-one.

(a) $\left[-\frac{\pi}{3}, \frac{\pi}{3}\right]$

(b) $\left[-\frac{\pi}{6}, \frac{\pi}{6}\right]$

(c) $\left[-\frac{2\pi}{3}, \frac{2\pi}{3}\right]$

(d) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

(e) $\left[-\frac{5\pi}{6}, \frac{5\pi}{6}\right]$

4. Calculate $\frac{d}{dx} \sqrt{x}^{\sqrt{x}} \Big|_{x=4}$.

(a) 2

(b) $\ln(2) + 1$

(c) 1

(d) $(\ln(2) + 2)/4$

(e) $4(\ln(2) + 1)$

5. Evaluate the integral $\int_1^2 \frac{dx}{x^2\sqrt{x^2+1}}$.

(a) $\sqrt{5} - \sqrt{2}$

(b) $1 - 1/\sqrt{2}$

(c) $\sqrt{2} - \sqrt{5}/2$

(d) $\sqrt{5}/2 - 1$

(e) $1/\sqrt{2} - 1/\sqrt{5}$

6. Find the slope of the tangent line to $y = \cosh^{-1}(x)$ at $x = 2$.

(a) $\frac{1}{\sqrt{3}}$

(b) $\frac{1}{\sqrt{5}}$

(c) $\frac{e^2 + e^{-2}}{2}$

(d) $\frac{e^2 - e^{-2}}{2}$

(e) $\frac{1}{2}$

7. Find the limit $\lim_{x \rightarrow 0^+} \tan^{-1}(\ln x)$.

(a) $-\pi$

(b) 0

(c) π

(d) $-\pi/2$

(e) $\pi/2$

8. A beaker of water at $100^\circ C$ cools to $40^\circ C$ in 30 minutes in a room with temperature $20^\circ C$. Determine the temperature of the water after t minutes.

(a) $20 + 80e^{t \ln(.25)/30}$

(b) $20 + 80e^{-30t \ln(.4)}$

(c) $100e^{t \ln(.4)/30}$

(d) $100e^{-30t \ln(.25)}$

(e) $20 + 100e^{t/30}$

9. If $f(x) = x^3 + \sin(2x) + \cos(x)$, find $(f^{-1})'(1)$.

(a) $\frac{1}{2}$

(b) $\frac{1}{3}$

(c) $\frac{1}{6}$

(d) $3 + 2 \cos(1) + \sin(1)$

(e) $\frac{1}{3 + 2 \cos(1) + \sin(1)}$

10. If $f(x) = \ln \sqrt{\frac{9-x}{5+x}}$, find $f'(2)$.

(a) $-1/7$

(b) $1/4$

(c) $\sqrt{5}/3$

(d) 1

(e) $-\sqrt{5}/6$

11. Evaluate $\int_0^{\ln(3)} \frac{e^x}{e^x + 1} dx$.

(a) $\ln(3)$

(b) $\frac{1}{\ln(3/2)}$

(c) $\ln(2)$

(d) $\frac{1}{\ln(4)}$

(e) $\frac{4}{\ln(2)}$

12. Compute $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x}\right)^x$ where a is a constant.

(a) e^{-a}

(b) e^a

(c) 1

(d) 0

(e) a/e