

Duration: 50 minutes

Instructions: Answer all questions, without the use of notes, books or calculators. Partial credit will be awarded for correct work, unless otherwise specified. The total number of points is 100.

1. (20 points: 10 points each)

(a) Approximate $\int_0^2 x^2 dx$ using the midpoint rule with $n = 4$.

(b) Find the exact value of $\int_0^2 x^2 dx$.

2. (20 points: 10 points each) Compute the following integrals.

(a)

$$\int \frac{1}{x (\ln x)^3} dx$$

(b)

$$\int_{\ln \pi - \ln 2}^{\ln \pi} e^x \sin(e^x) dx$$

3. (20 points) Let E be the function defined by $E(x) = \int_0^x e^{-t^2/2} dt$. Compute the following limit.

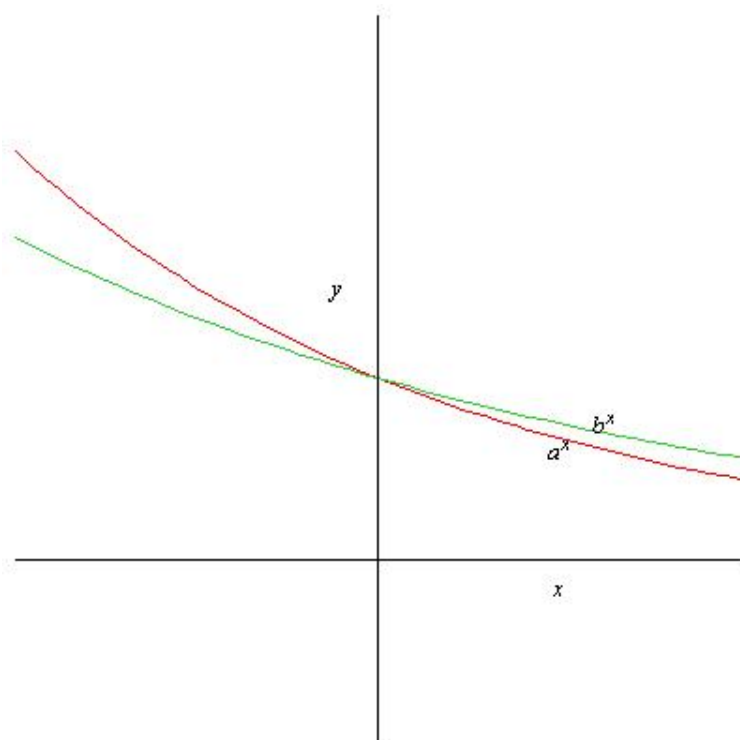
$$\lim_{x \rightarrow 0} \frac{E(x) - \sin x}{x^2}$$

4. (20 points: 10 points each) The function $f(x) = x^3 + \sinh x + 2$ is one-to-one. Let g be the inverse of f . Evaluate the following expressions.

(a) $g(2)$

(b) $g'(2)$

5. (20 points)



Refer to the adjacent picture to determine which of the following statements are true. (There may be more than one true statement! Correct answers with no work will be given full credit. Incorrect answers with correct work may be given partial credit.)

- (a) $b < 1$
- (b) $a > 0$
- (c) $a > b$
- (d) $\log_a x > \log_b x$ for all $x > 0$