

No calculators, notes, or books allowed. Do all work in the blue book. Cross out any work you do not want graded. Remember to **sign** your blue book: by doing so, you are pledging that you have neither given nor received assistance on this exam.

1. (12 points) Given that $\ln 2 \approx 0.693$ and $\ln 10 \approx 2.303$ (these are approximations), find or state that it cannot be found from the given information:

(a) $\ln 5$ (b) $\ln 12$ (c) $\ln 8$ (d) $\ln_2 10$

2. (9 points) Find

$$\sin^{-1}\left(\sin \frac{5}{6}\pi\right) \qquad \cos(\sin^{-1} 0.7) \qquad \sin(\sin^{-1} -0.7).$$

3. (12 points) Solve for x

$$\log_{10} e^x = 1 \qquad \ln(x+1) - \ln x = 1$$

4. (10 points) Find the inverse of

$$y = \frac{x+1}{2x-5}.$$

5. (18 points) Find dy/dx for

$$y = \ln(x + \sqrt{x^2 - 1}) \qquad y = (\ln x)^x \qquad y = 5^{\cos x} \sin^{-1} e^{2x}$$

6. (24 points) Find the integrals

$$\int_2^{16} \frac{dx}{x} \qquad \int_2^4 \frac{1+x-x^2}{x^2} \qquad \int \frac{\cos(\ln x)}{x} dx \qquad \int \frac{dx}{\sqrt{1-4x^2}}$$

7. (15 points) A bacteria culture starts with 1000 bacteria and the growth rate is proportional to the number of bacteria. After 2 hours the population is 9000.

- (a) Find an expression for the number of bacteria after t hours.
(b) Find the number of bacteria after 3 hours.
(c) In what time does the population triple?

You may leave your answers in terms of logarithms and exponential functions.