

4. Directions:

- Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number. Angle measures for trigonometric functions are assumed to be in radians.
- Solutions to equations must be real numbers. Determine the exact value of any expression that can be obtained without a calculator. For example, $\log_2 8$, $\cos\left(\frac{\pi}{2}\right)$, and $\sin^{-1}(1)$ can be evaluated without a calculator.
- Unless otherwise specified, combine terms using algebraic methods and rules for exponents and logarithms, where applicable. For example, $2x + 3x$, $5^2 \cdot 5^3$, $\frac{x^5}{x^2}$, and $\ln 3 + \ln 5$ should be rewritten in equivalent forms.
- For each part of the question, show the work that leads to your answers.

A. The functions g and h are given by

$$g(x) = e^{2x}$$

$$h(x) = \log_2(5x)$$

- Solve $g(x) = \frac{1}{e^6}$ for values of x in the domain of g .
- Solve $h(x) = 3$ for values of x in the domain of h .

B. The functions j and k are given by

$$j(x) = 7^{(3x+1)} \cdot 7^x$$

$$k(x) = \sin(2x) \sec x$$

- Rewrite $j(x)$ as an expression of the form $7^{(\text{expression})}$.
- Rewrite $k(x)$ as an expression in which $\sin x$ appears exactly once and no other trigonometric functions are involved.

C. The function m is given by $m(x) = \tan^2(3x)$.

Find all input values for m in the interval $\left[0, \frac{\pi}{2}\right]$ that yield an output value of 1.

STOP
END OF EXAM