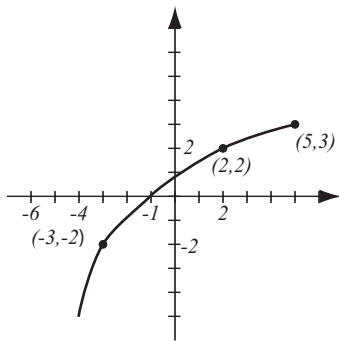**1.** (4pts) Let $f(x) = x^2 + 3x - 1$ and $g(x) = x - 5$. Find $(f \circ g)(x)$ and simplify.

2. (4pts) The graph of f is given. Explain why f has an inverse and find the graph of its inverse function.

3. (6pts) Solve the equations

$\log_x 8 = 2$

$$25^{x+2} = \left(\frac{1}{5}\right)^{3x-1}$$

4. (4pts) Evaluate without using the calculator:

$\log_4 16 =$ $\qquad$ $\log_2 \frac{1}{8} =$ $\qquad$ $\ln \sqrt{e} =$ $\qquad$ $\log_5 \sqrt[3]{25} =$

5. (3pts) Write as a sum of logarithms. Express powers as factors. Simplify if possible.

$\log_2(2^x(x+1)^3) =$

6. (3pts) Write as a single logarithm. Simplify if possible.

$\ln(x^2 + 7x + 12) - 3\ln(x + 4) =$

7. (5pts) Solve the equation.

$\log_2(x + 1) + \log_2(x + 3) = 3$

8. (7pts) The amount of carbon 14 in a specimen is given by $A(t) = A_0 e^{kt}$, where A_0 is the original amount of carbon 14.
a) Given that the half-life of carbon 14 is 5600 years, find what k is.
b) A fossilized leaf contains 70% of its original amount of carbon 14. How old is the fossil?

9. (2pts) Roughly sketch angles of measure $-70°$ and $\frac{3\pi}{5}$ radians.

10. (3pts) Mars makes one revolution in 1447 minutes. What is its angular speed in radians per second?

11. (5pts) In a right triangle, the leg adjacent to θ has length 7 and the hypothenuse has length 10. Find $\sin\theta$, $\cot\theta$ and $\sec\theta$.

12. (4pts) You are running on a circular path of radius 100m. If you have swept an angle of 105°, what distance have you run? (Hint: convert to radians.)

Bonus (5pts) Let $f(x) = 17 + 4e^{x-3}$. Find the formula for the inverse of this function.