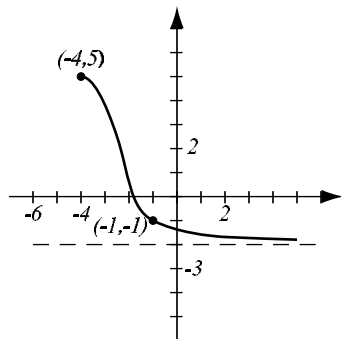


1. (3pts) Let $f(x) = x^2 + x$. Find $(f \circ f)(x)$ and simplify.

2. (4pts) The graph of f is given. Explain why f has an inverse and find the graph of its inverse function. Label the relevant points and indicate any asymptotes on the graph of f^{-1} .



3. (5pts) Find the inverse of $f(x) = \frac{2x}{x+7}$ and the range of f .

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

$$\log_2 32 =$$

$$\log_4 \frac{1}{256} =$$

$$\log_{25} \frac{1}{5} =$$

$$\ln \sqrt[3]{e^7} =$$

5. (7pts) Solve the equations

$$\log_3(2x - 1) = -2$$

$$8^{x^2+x} = \left(\frac{1}{2}\right)^{3x-9}$$

6. (3pts) Write as a sum of logarithms. Express powers as factors. Simplify if possible.

$$\log_7 \frac{49^{x+2}}{(x-4)^5} =$$

7. (3pts) Write as a single logarithm. Simplify if possible.

$$\frac{1}{2} \log_3(2x - 7)^4 + 3 \log_3(2x - 7)^3 =$$

8. (6pts) A rabbit population grows according to the law $N(t) = N_0 e^{kt}$.
- Given that the population doubles in 18 months, find k .
 - How long does it take for the rabbit population to triple?

9. (2pts) Roughly sketch angles of measure 140° and $-\frac{2\pi}{3}$ radians.

10. (5pts) Suppose $\sin \theta = \frac{2}{5}$ and $0 < \theta < \frac{\pi}{2}$. Find $\cos \theta$, $\tan \theta$ and $\sec \theta$.

11. (3pts) Simplify using basic trigonometric identities. Do not use the calculator.

$$\sin 42^\circ \csc 48^\circ - \tan 42^\circ =$$

12. (5pts) You would like to get a wedge of pizza that is exactly 15in^2 in area. If the *diameter* of the pizza is 12in, what is the angle (in degrees) of the desired wedge?

Bonus (5pts) Simplify:

$$\log_{\pi^2} \pi^9 =$$

$$\log_2 3 \cdot \log_3 4 \cdot \log_4 5 \cdots \log_n (n+1) \cdot \log_{n+1} 2 =$$