Math 150: Final Examination

Instructor: Sergei Chmutov

1. (25pt.) Let $f(x) = 3x - 4$ and $g(x) = x^2 - 3$.

(a) Find a formula for $(f \circ g)(x)$.

(b) Find a formula for $(g \circ f)(x)$.

(c) Find a formula for $f^{-1}(x)$.

---

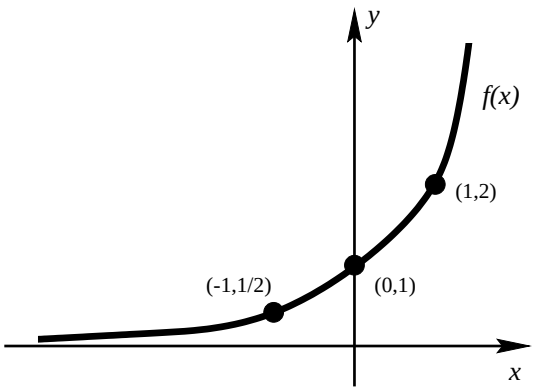
2. (20pt.) Find the asymptotes and draw the graph of the function $f(x) = \dfrac{2x^2 - x - 3}{x^2 + 3x + 2}$

3. (20pt.) Let $f(1) = 3$, $f(2) = 4$, $f(3) = 2$, $f(4) = 1$. Assuming that $f(x)$ has an inverse function $f^{-1}(x)$ find the following values $f^{-1}(1)$, $f^{-1}(2)$, $f^{-1}(3)$, $f^{-1}(4)$.

---

4. (15pt.) (a) Determine a formula for the exponential function $f(x)$ whose graph is given.

(b) Solve the equation $f(x) = 1/8$, where f is the function from the part (a).



5. (20pt.) Solve the equation $\log_3(2x+5) = \log_3(x-1) + 2$.

---

6. (15pt.) Let $\tan\theta = 1/3$ and $180° < \theta < 270°$. Find the exact value of each of the remaining trigonometric functions.

7. (15pt.) Simplify the expression $\dfrac{\sec^2\theta}{\sec^2\theta - 2} + \sec(2\theta)$

---

8. (15pt.) Solve the equation $\cos(2\theta) = \cos\theta$ on the interval $0 \leq \theta < 2\pi$.