MATH 125
SPRING 2019 NAME:
EXAM 2

1. [10 pts.] Expand $(2x+3)^5$ using the Binomial Theorem.

2. [10 pts.] Form a polynomial function of degree 4 having zeros -3 (with multiplicity 2), -1 (with multiplicity 1), and 5 (with multiplicity 1).

3. [2.5 pts. each] Let $f(x) = -4(x+4)^2(x+3)^5$.
   (a) List each real zero of f and its multiplicity.
   (b) Determine whether the graph of f crosses or touches the x-axis at each x-intercept.
   (c) Determine the maximum number of turning points on the graph of f.
   (d) Determine the end behavior of the graph of f.

4. [15 pts.] Let $f(x) = x^4 - x^3 - 6x^2 + 4x + 8$. Use the Rational Zeros Theorem to find all the real zeros of f, then use the zeros to factor f over the real numbers.

5. [10 pts.] Solve the equation in the real number system:

$$2x^3 - 11x^2 + 10x + 8 = 0.$$

6. [10 pts.] The complex number $1 + 3i$ is a zero of

$$f(x) = x^4 - 7x^3 + 14x^2 - 38x - 60.$$

   Find the remaining zeros of f.

7. [5 pts. each] For the rational function

$$T(x) = \frac{x^2 + 6x + 5}{2x^2 + 7x + 5}$$

   do the following.
   (a) Find the domain of T.
   (b) Find the intercepts of T.
   (c) Find all vertical asymptotes of T, if any.
   (d) Find the horizontal or oblique asymptote of T, if any.

8. [10 pts. each] Solve each inequality algebraically.

   (a) $x^3 - 2x^2 - 3x > 0$.

   (b) $\dfrac{x-4}{2x+4} \geq 1$

9. [10 pts.] For $f(x) = \sqrt{x+1}$ and $g(x) = 3x$ find $(f \circ g)(4)$, $(g \circ f)(2)$, $(f \circ f)(1)$, and $(g \circ g)(0)$.

10. [10 pts. each] Let

$$f(x) = x^2 + 1 \quad \text{and} \quad g(x) = \sqrt{x-1}.$$

   (a) Find $f \circ g$, and state its domain.

   (b) Find $g \circ f$, and state its domain.

   (c) Find $g \circ g$, and state its domain.

11. [10 pts. each] Find the inverse of each function.

   (a) $f(x) = x^3 + 1$

   (b) $g(x) = \dfrac{x^2 - 4}{2x^2}, \quad x > 0$