Name:	Student ID:

MATH 3: Exam 2

Problem 1. (5 points) Determine whether the following statements are **TRUE** or **FALSE**. No justification is required.

(a) (1 point) If α and β are the two acute interior angles of a right triangle, then $\cos(\alpha) = \sin(\beta)$. Hint: draw a picture.

Answer: ☐

(b) (1 point) The function $f(x) = \sin(\theta)$ is one-to-one.

Answer: ☐

(c) (1 point) If $f(x)$ is a polynomial and $f(k) = 0$, then the remainder of $f(x)$ divided by $x - k$ is equal to 0.

Answer: ☐

(d) (1 point) An angle in standard position has infinitely many coterminal angles.

Answer: ☐

(e) (1 point) If α is the reference angle of an angle θ in standard position, then $\cos(\theta) = \cos(\alpha)$.

Answer: ☐

Problem 2. (8 points) Let $f(x) = x^5 + x^4 + x^3 + x^2 + x + 1$.

(a) (6 points) Divide $f(x)$ by $x^2 + x + 1$ using long division.

(b) (2 points) Identify the quotient $q(x)$ and the remainder $r(x)$.

Problem 3. (9 points) Let $f(x) = x^3 - 4x^2 + 5x - 2$.

(a) (3 points) List all possible rational zeros of $f(x)$.

(b) (3 points) Determine all rational zeros of $f(x)$.

(c) (3 points) Factor $f(x)$ as a product of three linear (degree 1) polynomials.

Problem 4. (8 points) Let $f(x) = \frac{(x-1)(x-5)(x-4)}{(x-2)(x-3)(x-4)}$.

(a) (2 points) Determine the x and y intercept(s) of $f(x)$.

(b) (2 points) Determine the vertical asymptote(s) of $f(x)$.

(c) (2 points) Determine the horizontal or slant asymptote of $f(x)$.

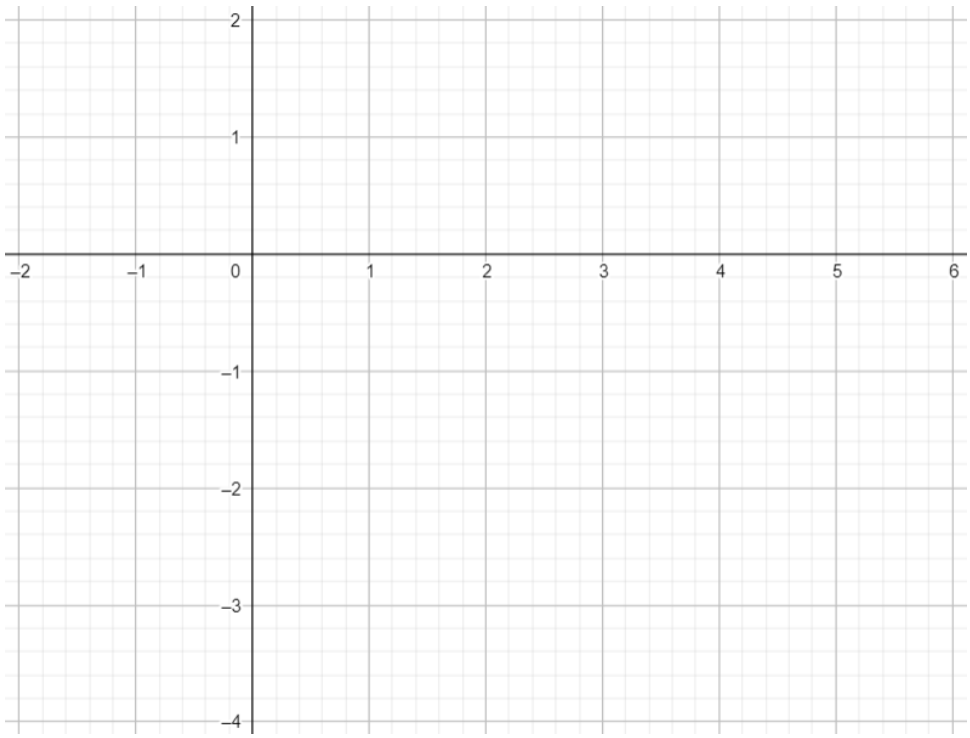
(d) (2 points) Determine the removable discontinuity of $f(x)$, if one exists.

Problem 5. (6 points) Let $f(x) = 1 - 2 \cdot 2^{-x}$.

(a) (2 points) Find the horizontal asymptote, x and y intercepts of $f(x)$.

(b) (2 points) Is the function $f(x) = 1 - 2 \cdot 2^{-x}$ increasing or decreasing?

(c) (2 points) Sketch a graph of $f(x) = 1 - 2 \cdot 2^{-x}$.

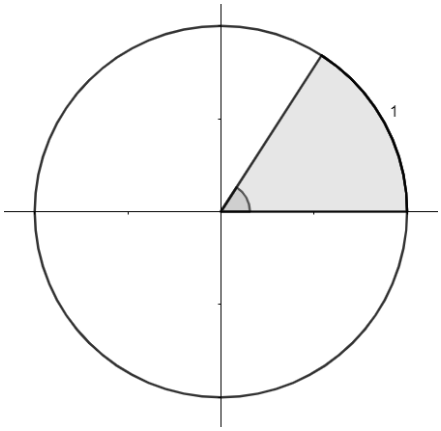


Problem 6. (10 points) Find all solutions of the following equations. Be sure to check your answer for "nonsense".

(a) (5 points) Solve $e^{2x} - e^x - 6 = 0$.

(b) (5 points) Solve $\ln(x+1)+\ln(x-1)=\ln(1)$.

Problem 7.(4 points) Consider the following sector of the *unit circle*. The length of the arc determined by the angle is equal to one. Find the area of the sector.



Problem 8.(12 points) Suppose that $\tan\theta = \frac{4}{3}$ and $\sin(\theta) < 0$.

(a) (2 point) Determine which quadrant θ lies in.

(b) (2 points) Find $\sec\theta$.

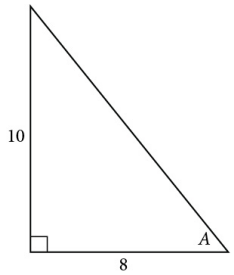
(c) (2 points) Find $\cot\theta$.

(d) (2 points) Find $\csc\theta$.

(e) (2 points) Find $\sin\theta$.

(f) (2 points) Find $\cos\theta$.

Problem 9. (12 points) Consider the following right triangle.



(a) (2 points) Find the length of the hypotenuse using the Pythagorean Theorem.

(b) (2 points) Find $\sin(A)$.

(c) (2 points) Find $\cos(A)$.

(d) (2 points) find $\tan(A)$.

(e) (2 points) find $\cot(A)$.

(f) (2 points)Find $\sec(A)$.

(g) (2 points) Find $\csc(A)$.

Problem 10. (6 points) Find the unknown side lengths a and c of the following triangle.