

MATH 141
Midterm 1
February 22, 2001

1. (**10 points**) Solve the inequalities:

(a) $4 < 2x + 1 < 8$

(b) $|5x - 2| < 7$

2. (**10 points**)

(a) Find the slope of the line through the points $(2, 1)$ and $(1, 6)$.

(b) Write the equation of this line.

(c) Write the equation of the line parallel to the line in (b) that goes through $(-1, -2)$.

(d) Write the equation of the line perpendicular to the line in (b) that goes through $(5, 3)$.

3. (**10points**)

(a) Convert from degrees to radians:

270°

135°

(b) Convert from radians to degrees:

$\frac{\pi}{6}$

$\frac{-7\pi}{2}$

(c) Find the exact value of:

$\sin\left(\frac{\pi}{4}\right)$

$\cos 3\pi$

$\tan\left(\frac{2\pi}{3}\right)$

$\arctan(\sqrt{3})$

$\sin(\arcsin 1)$

$\sec(0)$

4. **(10 points)** Let $f(x) = \sqrt{x}$ and $g(x) = 3 - x$. Compute $f \circ g$ and $g \circ f$ and find their domains.
5. **(8 points)** Find the inverse of the function $f(x) = \ln(\sqrt{x})$
6. **(12 points total)** Solve the equations:
- (a) $\ln(2x - 1) = -2$
 - (b) $3^{x-1} = 4$
 - (c) $8^{2x} = 8^{x^2+1}$
 - (d) $\ln(x) - \ln 9 = \ln(x^3)$
7. **(15 points)** Compute the limits:
- (a) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$
 - (b) $\lim_{x \rightarrow 0} \frac{\sqrt{4 + x^2} - 2}{x^2}$
 - (c) $\lim_{x \rightarrow -1} \frac{x^3 + 2}{x^2 + 4}$
 - (d) $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{2}{x}\right)$
 - (e) $\lim_{x \rightarrow 1^-} \frac{x^2 - 2x + 7}{(x - 1)(x + 3)}$
8. **(5 points)** Find the discontinuities of the function $f(x) = \frac{\sin(x)}{x + 1}$.
9. **(10 points)** Find c such that the function f is continuous on \mathbb{R} .

$$f(x) = \begin{cases} 2x + 1 & , x \leq 4 \\ cx - 3 & , x > 4 \end{cases}$$

10. **(10 points)** Show that the equation $\cos(x) - x^2 = 0$ has at least one solution in the interval $(0, 1)$.