# MATH 1150 FINAL EXAM

Name (CAPITALS): _____________________________  Section Number: ___

Thursday, December 11, 2014  8:00 AM — 12:00 NOON

Calculators are NOT allowed!  NO PHONES ALLOWED ON DESKS

1. DO NOT START THE EXAM UNTIL THE PROCTOR TELLS YOU TO BEGIN!!!
2. Do NOT SEPARATE answer page from rest of test.
3. Work and CIRCLE the answer to each problem INSIDE this test.
4. Circle your answers a SECOND time on this page.
5. Blank answers are considered INCORRECT; no penalty for wrong answers
6. Do all 30 Problems, each carries equal weight
7. Turn in ENTIRE test, showing ALL work leading to your answer.

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1: Which of the following statements is correct?

a. $\sqrt{|a|^2} = a$

b. $\sqrt{a^2} = a$

c. $\sqrt{a^2} = |a|$

d. $(\sqrt{|a|})^2 = a$

e. None of the above

2: Which of the following lines is perpendicular to $y = 5x - 7$?

a. $y = 5x + 3$

b. $y = -\frac{1}{5}x - \frac{1}{5}$

c. $y = -5x + \frac{3}{5}$

d. $y = 5x - \frac{1}{5}$

e. None of the above

3: Which of the following is the equation of a circle?

a. $3x^2 - 2y^2 = 5$

b. $\sqrt{2x^2} + \sqrt{2y^2} - 11x + 13y = 0$

c. $x^2 + 2y^2 - 11x + 13y = 0$

d. $xy = 1$

e. None of the above

4: If $\sin(x) = \frac{4}{5}$ and $\cos(x) > 0$, then $\cos(x)$ is equal to

a. $\frac{2}{5}$

b. $\frac{4}{\sqrt{5}}$

c. $\frac{2}{5}\sqrt{5}$

d. $\frac{3}{5}$

e. None of the above

5: $\frac{1}{1 + \tan^2 x}$ is equal to

a. $\cos^2 x$

b. $\cot^2 x$

c. $\sin^2 x$

d. $\sec^2 x$

e. None of the above
6: Which of the following functions is even?

a. \( f(x) = \ln |x| \)
b. \( f(x) = x^2 + \sin x \)
c. \( f(x) = \ln(1 + e^x) \)
d. \( f(x) = \frac{1+e^{-x}}{1+e^x} \)
e. None of the above

7: Which of the following functions is odd?

a. \( f(x) = \ln(1 - e^x) \)
b. \( f(x) = \frac{1-e^{-x}}{1-e^x} \)
c. \( f(x) = \sin(\sin x) \)
d. \( f(x) = \sin(\cos x) \)
e. None of the above

8: Which of the following functions has an inverse?

a. \( f(x) = x^2 \)
b. \( f(x) = \frac{1}{\ln |x|} \)
c. \( f(x) = 1 + \ln x \)
d. \( f(x) = x^{\frac{3}{2}} \)
e. None of the above

9: If \( f(x) = e^{(\ln x)^2} \) and \( g(x) = (\ln x)^2 \), then \( g(f(x)) \) is equal to

a. \( x^2 \)
b. \( (\ln x)^2 \)
c. \( (\ln x)^4 \)
d. \( x^4 \)
e. None of the above

10: If \( x > 0 \), then \( x^x \) is equal to

a. \( e^{(\ln x)^2} \)
b. \( x^{-x} \)
c. \( \left( \frac{1}{2} \right)^{\frac{1}{x}} \)
d. \( e^{x \ln x} \)
e. None of the above
11: If $P(x) = f(g(x)) = \frac{1}{x^2 + 2x + 2}$, and $f(x) = \frac{1}{1 + x^2}$, then $g(x)$ is equal to

a. $x + 1$

b. $2x + 1$

c. $x - 1$

d. $2x - 1$

e. None of the above

12: The limit

$$\lim_{x \to 1^+} \frac{\sin x}{1 - x^3}$$

a. has the value 1

b. has the value $-1$

c. has the value $\infty$

d. has the value $-\infty$

e. None of the above

13: The limit

$$\lim_{x \to 0^+} \frac{1 - |x|}{\ln x}$$

a. has the value 0

b. has the value $-\infty$

c. has the value $\infty$

d. has the value 1

e. None of the above

14: If the limit $\lim_{x \to 0} \frac{f(x)}{x}$ exists, then

a. $\lim_{x \to 0} f(x) = \infty$

b. $\lim_{x \to 0} f(x) = -\infty$

c. $\lim_{x \to 0} f(x) = 0$

d. a real number other than zero

e. None of the above

15: The limit

$$\lim_{x \to -1^-} \frac{|x + 1|}{x + 1}$$

a. has the value 0

b. has the value 1

c. has the value $-1$

d. does not exist

e. None of the above
16: The derivative of the function \( \sqrt{\arctan x} \) is
a. \( \frac{1}{2\sqrt{\arctan x}} \)
b. \( \frac{1}{2(\sqrt{\arctan x})(1+x^2)} \)
c. \( \sqrt{\arctan x} \)
d. \( \frac{1+x^2}{2\sqrt{\arctan x}} \)
e. None of the above

17: The function \( f(x) = |x| \) is an example of a function which is
a. continuous everywhere but not differentiable everywhere
b. differentiable everywhere but not continuous everywhere
c. both continuous and differentiable everywhere
d. neither continuous nor differentiable everywhere
e. None of the above

18: The limit \( \lim_{x \to \infty} \cos x \)
a. has the value \( \infty \)
b. has the value \( -\infty \)
c. has the value 0
d. is not defined
e. None of the above

19: The limit \( \lim_{x \to -\infty} \frac{x^3 + 3x^2}{\sqrt{x^6 + x^3 + 4x}} \)
a. has the value \( \infty \)
b. has the value \( -\infty \)
c. has the value -1
d. has the value 1
e. None of the above

20: The function \( f(x) = \cos 2x + 2 \cos x \) has a horizontal tangent in \([0, 2\pi]\) at the point(s) \( x = \)
a. 0
b. 0, \( \pi \)
c. 0, \( \pi, 2\pi/3 \)
d. 0, \( \pi, 2\pi/3, 4\pi/3 \)
e. None of the above
21: If \( f(x) = \ln(\sec x) \), then \( f'(3\pi/4) \) is equal to

a. \(-\sqrt{2}\)
b. \(\sqrt{2}\)
c. \(-1\)
d. \(1\)
e. None of the above

22: The limit

\[
\lim_{x \to 2^-} \frac{x^2 + x - 6}{|x - 2|}
\]

a. has the value 5
b. has the value \(-5\)
c. has the value \(-\infty\)
d. is not defined
e. None of the above

23: The equation of the line tangent to the curve \( y^3 + 2xy + x^3 = 4 \) at the point \((1, 1)\) is

a. \(y = -x + 2\)
b. \(y = x + 2\)
c. \(y = -x - 3\)
d. \(y = x\)
e. None of the above

24: The equation of the tangent line to the graph of the function \( f(x) = e^x/(x^2 + 3x + 2) \) when \( x = 0 \) is

a. \(y = -x/2 + 2\)
b. \(y = 5x - 2\)
c. \(y = -5x + 2\)
d. \(y = -x/4 + 2\)
e. None of the above

25: The limit

\[
\lim_{x \to \infty} \ e^{\tan^{-1} x}
\]

a. has the value 0
b. has the value \(\infty\)
c. has the value \(e^{\pi/2}\)
d. has the value \(e^{-\pi/2}\)
e. None of the above
26: If \( f(x) = \sin x \), then \( f^{(7)}(\pi/6) \) equals (hint: \( f^{(7)}(x) \) is the \textbf{seventh} derivative of \( f(x) \))
   a. \( \sqrt{3}/2 \)
   b. \( \sqrt{2}/2 \)
   c. \( -\sqrt{3}/2 \)
   d. 0
   e. None of the above

27: If \((f \circ g)(x)\), and \( g(5) = 4, g'(5) = 2, f(5) = 7, f'(4) = 3, f'(5) = 5\), then \( f'(g(5)) \) is equal to
   a. 2
   b. 5
   c. 6
   d. 10
   e. None of the above

28: If \( f(x) = \sin^{-1}(\csc x) \), then \( f'(x) \) equals
   a. \( \sec^2 x / \sqrt{1 - x^2} \)
   b. \( -\csc x \cot x / \sqrt{1 - x^2} \)
   c. \( \sec^2 x / \sqrt{1 - (\sec x)^4} \)
   d. \(-\csc x \cot x / \sqrt{1 - (\csc x)^2} \)
   e. None of the above

29: The vertical and horizontal asymptotes of the function \( f(x) = \frac{1+x^4}{x^2-4} \) are
   a. no vertical asymptotes, \( y = 0 \) the only horizontal asymptote
   b. no horizontal asymptotes, \( x = 0 \) and \( x = 1 \) are the vertical asymptotes
   c. horizontal asymptote \( y = -1 \), vertical asymptotes are \( x = 0, x = 1, \) and \( x = -1 \)
   d. horizontal asymptote \( y = 0 \), vertical asymptotes are \( x = 0, x = 1, \) and \( x = -1 \)
   e. None of the above

30: If \( f(x) = e^{5x} \), then \( f'''(1) \) equals
   a. \( e^5 \)
   b. 5
   c. 125
   d. 125e^5
   e. None of the above