MATH 151 Spring 2008 Practice Final

- 1. Find the angle between vectors $\vec{a} = < 3, 4 >$ and $\vec{b} = < -1, 2 >$.
 - (a) $\cos(1/\sqrt{5})$ (b) $\cos(\sqrt{5})$ (c) $1/\sqrt{5}$ (d) $\cos^{-1}(1/\sqrt{5})$
 - (e) $\cos^{-1}(\sqrt{5})$

2. Find the distance between the line y = x and the point (0,1).

- (a) $1/\sqrt{5}$ (b) 1/2(c) $1/\sqrt{2}$ (d) $\sqrt{2}$
- **(e)** 1
- 3. $e^{\ln 6 \frac{3}{4}\ln 16} =$
 - (a) e (b) 3/4
 - (c) 1/3
 - (d) 3/4
 - (e) 4/3
- 4. If $f(x) = x^7 + 3x + 1$ and $g = f^{-1}$, then g'(1) =(a) -1/10(b) 1/10(c) 1 (d) 3 (e) 1/3

5. Find the quadratic approximation to the function $f(x) = \sqrt{1+x}$ near 0.

(a) $1 + \frac{x}{2}$ (b) $1 + \frac{x}{2} - \frac{x^2}{8}$ (c) $1 + \frac{x}{2} + \frac{x^2}{8}$ (d) $1 + \frac{x}{2} - \frac{x^2}{4}$ (e) $1 + \frac{x}{2} + \frac{x^2}{4}$

8. A curve is given by the parametric equations $x(t) = t^3 - 1 + \ln t$, $y(t) = t^2$. Find the slope of the tangent line at t = 1.

(a) 3/4 (b) 4/3(c) -3/4(d) 1/2 (e) 1

9. Find the area bounded by the graph of the function $y = x^3$, the *x*-axis, and the line x = 1.

- (a) 1/4 **(b)** 1/5 (c) 1/6(d) 1/7
- (e) 1/8

10. Find all vertical asymptotes of the curve $y = \frac{x+7}{x^2-49}$ (a) x = 7 and x = -7

- (b) x = 7 only
- (c) x = -7 only
- (d) x = 0
- (e) there are no vertical asymptotes

11. A farmer with 1000 ft of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle. What is the largest possible total area of the four pens?

12. Evaluate the integral
$$\int_{e}^{e^2} \frac{1}{t \ln^2 t} dt$$
.

13. Find a vector equation and parametric equations to the line that passes through the points $M_1(1, -2)$ and $M_2(2, 0)$.

14. Find and classify all critical points of the function $f(x) = 4x^3 - 9x^2 - 12x + 3$.

15. Find the equation of the tangent line to the curve $x^3 + y^3 = 6xy$ at the point (3,3).

16. Find $(\sin(2x))^{(2008)}$, i.e. the 2008-th derivative of $\sin(2x)$.

17. Find each limit: (a) $\lim_{x \to 0} \frac{\tan x - \sin x}{x - \sin x}$ (b) $\lim_{x \to \infty} x^3 e^{-x^2}$ (c) $\lim_{x \to 0} (1 - 2x)^{1/x}$

18. Find the intervals of the concavity and the inflection point(s) of the function $f(x) = (1 + x^2)e^x$.

19. A particle moves along a straight line and has acceleration given by $a(t) = t^2 - t$. Its initial velocity is v(0) = 2 cm/s and its initial displacement is s(0) = 1 cm. Find the position function s(t).

20. Find the vector function $\vec{r}(t)$ that gives the position of a particle at time *t* having the acceleration $\vec{a}(t) = 2t\vec{i} + \vec{j}$, initial velocity $\vec{v}(0) = \vec{i} - \vec{j}$, and initial position (1, 0).