

Spring 2008
Math 151
Common Exam 1
Test Form A

PRINT: Last Name _____ First Name: _____

Signature: _____ ID: _____

Instructor's Name: _____ Section # _____

INSTRUCTIONS

In **Part 1** (Problems 1–10), mark the correct choice on your ScanTron form using a #2 pencil. *For your own records, also record your choices on your exam!* The ScanTrons will be collected after 1 hour; they will NOT be returned.

In **Part 2** (Problems 11–15), write all solutions in the space provided. All work to be graded must be shown in the space provided. **CLEARLY INDICATE YOUR FINAL ANSWERS**

No Calculators Permitted

1. In which interval does the polynomial $f(x) = -x^3 - 5x + 3$ have a root?

- (a) $[-2, -1]$ (b) $[-1, 0]$ (c) $[0, 1]$ (d) $[1, 2]$ (e) $[2, 3]$

2. $\lim_{x \rightarrow 0} \frac{1}{x} \sin\left(\frac{1}{x}\right) =$

- (a) 0 (b) 1 (c) $\sin\left(\frac{1}{\pi}\right)$ (d) π (e) does not exist

3. Consider the function $f(x) = (x^2 - x - 1)(x^3 + x^2 + 1)$. Find the derivative $f'(x)$.

- (a) $f'(x) = (2x - 1)(3x^2 + 2x)$
(b) $f'(x) = 5x^4 - 6x^2 - 1$
(c) $f'(x) = (2x - 1)(x^3 + x^2 + 1) - (x^2 - x - 1)(3x^2 + 2x)$
(d) $f'(x) = 3x^2 + 4x$
(e) $f'(x) = (x - 1)(x^3 + x^2 + 1) + (x^2 - x - 1)(x^2 + x)$

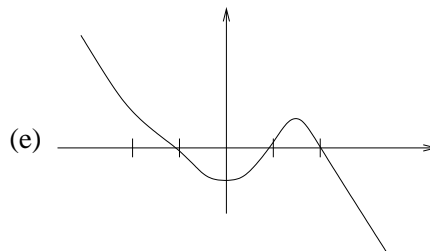
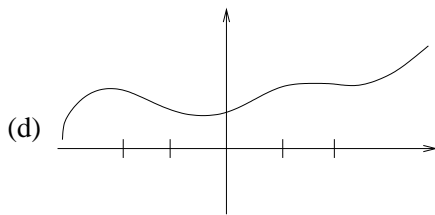
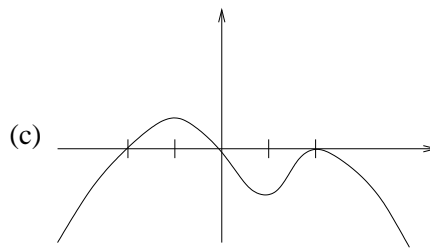
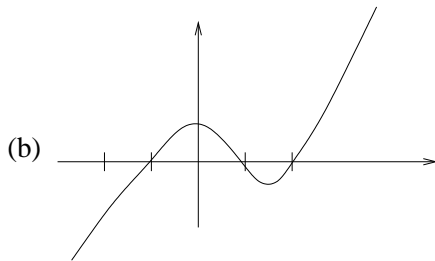
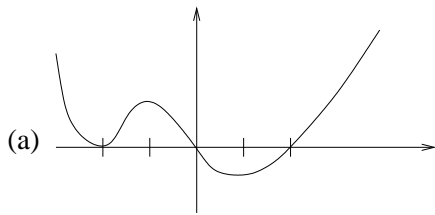
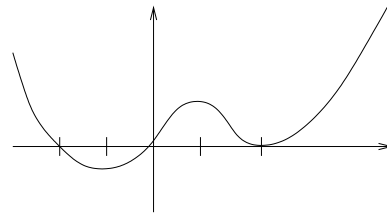
4. Find the equation of the line tangent to the curve $y = \sqrt{x}$ at $(9, 3)$.

- (a) $y = \frac{1}{3}x$ (b) $y = \frac{1}{6}x$ (c) $y = -3x + 30$ (d) $y = \frac{1}{6}x + \frac{3}{2}$ (e) $y = -6x + 9$

5. Find the distance between the point $(-1, 3)$ and the straight line $y = 5x - 9$.

- (a) $\frac{17}{\sqrt{26}}$ (b) $\frac{33}{\sqrt{26}}$ (c) $\frac{26}{\sqrt{17}}$ (d) $\frac{33}{\sqrt{53}}$ (e) $\frac{17}{\sqrt{53}}$

6. Consider the function f whose graph is shown. Find the graph of f' .



7. A projectile is fired into the air at an angle. The position vector of the projectile at time t is given by $\vec{r}(t) = \langle 50t, 120t - 16t^2 \rangle$, where the 1st component is the down-range coordinate and the 2nd component is the vertical coordinate. Find the instantaneous velocity at $t = 3$.

- (a) $\langle 150, 216 \rangle$ (b) $6\sqrt{1921}$ (c) $2\sqrt{769}$ (d) $\langle 50, 24 \rangle$ (e) $\langle 50, 72 \rangle$

8. Find the vector projection of $\langle -10, 7 \rangle$ onto $\langle 5, 12 \rangle$.

- (a) 34 (b) $\frac{34}{169}\langle 5, 12 \rangle$ (c) $\frac{34}{149}\langle -10, 7 \rangle$ (d) $\frac{34}{13}$ (e) $\frac{34}{\sqrt{149}}$

9. Find the vertical asymptotes of the curve $y = \frac{2x^2 - 3x + 1}{x^2 - 1}$.

- (a) $x = -1$ (b) $x = 1$ (c) $x = \pm 1$ (d) $y = 2$ (e) $x = \frac{1}{2}$

10. Which function is continuous at $x = 3$?

- (a) $f(x) = \frac{x-3}{|x-3|}$ (b) $f(x) = \begin{cases} x+3, & x < 3, \\ 3x, & x \geq 3 \end{cases}$
(c) $f(x) = \begin{cases} 9-x^2, & x < 3, \\ x-3, & x \geq 3 \end{cases}$ (d) $f(x) = \frac{1}{x^2 - 6x + 9}$
(e) $f(x) = \frac{x^2 - 6x + 9}{x^3 - 27}$

**Show your work. Partial credit is possible.
No credit will be given to unsupported answers.**

11. An automobile safety advertisement claims that hitting a stone wall at 60 mph is equivalent to having your vehicle roll off the roof of a building of height h . Assuming that the acceleration due to gravity is 32 ft./sec^2 , find h . (Recall from your driving test that $60 \text{ mph} = 88 \text{ ft./sec.}$) (8 points)

12. Find the derivative $f'(x)$ of each function $f(x)$. (6 points each)

(a) $f(x) = \frac{x^2 + 3x + 2}{x^2 - 1}$

(b) $f(x) = x^2 + 3x\sqrt{x} - 4x + 9\sqrt{x} - 8 + \frac{2}{\sqrt{x}} + \frac{5}{x}$

13. Let $f(x) = \sqrt{x+2}$ for $x \geq -2$. Calculate $f'(\frac{1}{4})$ by using the definition of derivative. (10 points)

14. Find the Cartesian equation of the line perpendicular to the line given by the parametric equations

$$x = 4s + 3$$

$$y = 3s - 4$$

and passing through the point (2,1). (8 points)

15. Calculate the following limits. You may **not** use L'Hospital's Rule. (4 points each)

(a) $\lim_{x \rightarrow \infty} \frac{1 - \cos x}{x^2}$

(b) $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x^2 - 1}$

(c) $\lim_{x \rightarrow \infty} \frac{3x^3 - x + 5}{5x^3 + x^2 - 3}$