MATH 151
SPRING 2015

SAMPLE EXAM I

To be worked Wednesday, 2/18, 7:30-9:30 pm BLOC 169

Part I - Multiple Choice

1. What is the slope of the line with parametric equations $x = 2t + 3$, $y = 7t - 2$?

a) $\frac{7}{2}$

b) $\frac{-2}{7}$

c) $\frac{3}{2}$

d) $\frac{-2}{3}$

e) $\frac{2}{7}$

2. What value of x makes the vectors $\langle 1, x \rangle$ and $\langle 3 - 4x, 5 \rangle$ perpendicular?

a) $x = -3$

b) $x = -1$

c) $x = 0$

d) $x = 1$

e) $x = 3$

3. Which of the following gives parametric equations of the line passing through $(-1, 1)$ and perpendicular to the line $x = 4 - 3t$, $y = 5 + t$?

a) $\mathbf{r}(t) = \langle -2 - t, -2 + t \rangle$

b) $\mathbf{r}(t) = \langle -1 - t, 1 - 3t \rangle$

c) $\mathbf{r}(t) = \langle -1 + t, 1 + 3t \rangle$

d) $\mathbf{r}(t) = \langle -2 - 3t, -2 - t \rangle$

e) both (b) and (c) are correct

4. $\lim_{x \to 4} \dfrac{2x^2 - 32}{x - 4} =$

a) 1 b) 0 c) 2 d) does not exist e) 16

5. $\lim_{x \to 0^+} \dfrac{x^2 - 2x}{x} =$

a) 0 b) 2 c) $-\infty$

d) ∞ e) -2

6. $\lim_{x \to 0^-} \dfrac{x^2 - 2x}{|x|} =$

a) 0 b) 2 c) $-\infty$

d) ∞ e) 1

7. $\lim_{x \to 0^+} \dfrac{x-2}{x} =$

a) 0 b) -2 c) $-\infty$

d) ∞ e) 1

8. According to the Intermediate Value Theorem, the equation $x^3 - 2x^2 + x = -5$ has a solution in which of the following intervals?

a) $[-3, -2]$ b) $[2, 3]$

c) $[-2, -1]$ d) $[-1, 0]$

e) $[0, 1]$

9. $\lim_{x \to 1} \dfrac{x+1}{(x-1)^2} =$

a) 0 b) does not exist c) $-\infty$

d) ∞ e) 1

10. If $f(x) = \begin{cases} 5 - \frac{2}{5}x & \text{if } x < 5 \\ 3 & \text{if } 5 < x < 8 \\ 9 - x & \text{if } x > 8 \end{cases}$, determine which of the following statements is true.

a) f is continuous at $x = 5$

b) $\lim_{x \to 5} f(x)$ does not exist.

c) $\lim_{x \to 8^+} f(x) = 3$

d) $\lim_{x \to 5} f(x) = 3$

e) f is continuous for all values of x.

11. Find the work done by a force of 20 Newtons acting in the direction $N25°W$ in moving an object 4 meters due west.

a) $20\cos(25°)$ Joules

b) $80\cos(25°)$ Joules

c) $80\cos(65°)$ Joules

d) $20\cos(65°)$ Joules

e) None of the avove

12. Given the points $P(4, -4)$ and $Q(5, -2)$, find a unit vector in the direction of the vector starting at P and ending at Q.

a) $\frac{1}{\sqrt{5}}\mathbf{i} + \frac{2}{\sqrt{5}}\mathbf{j}$ b) $\frac{140}{\sqrt{29}}\mathbf{i} - \frac{56}{\sqrt{29}}\mathbf{j}$ c) $9\mathbf{i} - 6\mathbf{j}$

d) $\mathbf{i} + 2\mathbf{j}$ e) $\frac{9}{\sqrt{117}}\mathbf{i} - \frac{6}{\sqrt{117}}\mathbf{j}$

13. $\lim_{x\to\infty} \dfrac{6x^2 - x - 3}{2 + 3x - 3x^2} =$

a) 3 b) 1 c) ∞ d) -2 e) $-\dfrac{3}{2}$

14. The points $A(-1, 2)$, $B(2, 1)$, and $C(0, 5)$ form a triangle. Find angle C.

a) $45°$ b) $30°$ c) $135°$ d) $150°$ e) $90°$

15. The parametric curve determined by the equations $x = \sin t$, $y = \cos^2 t$, $0 \leq t \leq \dfrac{\pi}{2}$ forms:

a) part of a parabola

b) part of a hyperbola

c) part of a circle

d) line segment

e) none of the above

16. Find all vertical asymptotes for the curve $\dfrac{x-2}{x^2-4}$

a) $x = 0$

b) $x = -2$ and $x = 2$

c) $x = -2$ only

d) $x = 2$ only

e) There are no vertical asymptotes.

17. Find the components of the vector $\mathbf{r}$ given that the magnitude of $\mathbf{r}$ is 7 and $\mathbf{r}$ creates an angle of $120°$ with the positive x axis.

a) $\mathbf{r} = \left\langle \dfrac{7}{2}, \dfrac{7\sqrt{3}}{2} \right\rangle$

b) $\mathbf{r} = \left\langle \dfrac{7\sqrt{3}}{2}, \dfrac{7}{2} \right\rangle$

c) $\mathbf{r} = \left\langle -\dfrac{7\sqrt{3}}{2}, \dfrac{7}{2} \right\rangle$

d) $\mathbf{r} = \left\langle -\dfrac{7}{2}, -\dfrac{7\sqrt{3}}{2} \right\rangle$

e) $\mathbf{r} = \left\langle -\dfrac{7}{2}, \dfrac{7\sqrt{3}}{2} \right\rangle$

Part II - Work Out Problems

All answers must be algebraically supported to receive full credit.

18. If two forces given by $\mathbf{F_1} = \langle 1, 5\rangle$ and $\mathbf{F_2} = \langle 4, 1\rangle$ are acting on an object sitting at the origin, find the resultant force as well as its magnitude and direction.

19. Use the limit definition to find the derivative, $f'(x)$, of $f(x) = \sqrt{2-3x}$. Next, find the slope of the tangent line to the graph of $f(x)$ at $x = -1$.

20. Find the vector projection and the scalar projection of $\langle -6, -5\rangle$ onto $\langle 1, -4\rangle$.

21. Find the distance from the point $(2, 3)$ to the line $y = 4x + 5$

22. Evaluate $\lim\limits_{x\to 3} \dfrac{|x-3|}{x^2-9}$, if it exists. If the limit does not exist, support your answer by evaluating left and right hand limits.

23. Find values of a and b which make $f(x)$ continuous for all x, if possible. If not possible,explain why.

$$f(x) = \begin{cases} \dfrac{x^2-1}{x-1} & \text{if } x < 1 \\ ax^2 - bx + 3 & \text{if } 1 \le x < 2 \\ 2x - a + b & \text{if } x \ge 2 \end{cases}$$

24. Find $\lim\limits_{x\to 3} \dfrac{\dfrac{1}{x+4} - \dfrac{1}{7}}{x-3}$

25. Find $\lim\limits_{x\to\infty} \dfrac{\sqrt{10x^2-5}}{2-3x}$ and $\lim\limits_{x\to-\infty} \dfrac{\sqrt{10x^2-5}}{2-3x}$