Math 2013 Final Study Practice Quiz Fall 2011

Name: Last _____, First _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. You must show your work to get credit.

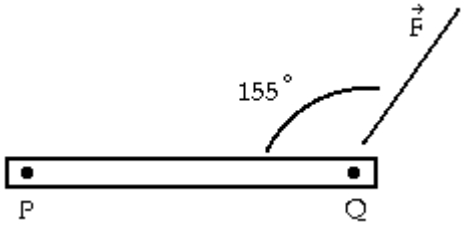
Find the angle between u and v in radians.

1) $\mathbf{u} = 2\mathbf{i} - 3\mathbf{j} - 3\mathbf{k}$, $\mathbf{v} = 10\mathbf{i} + 4\mathbf{j} - 4\mathbf{k}$ 1) _____

A) 1.19 B) 1.56 C) 0.38 D) 1.44

Solve the problem.

2) Find the magnitude of the torque in foot–pounds at point P for the following lever: 2) _____



$\left|\overrightarrow{PQ}\right| = 4$ in. and $|\mathbf{F}| = 30$ lb

A) 4.23 ft–lb B) 120 ft–lb C) 14.37 ft–lb D) 9.06 ft–lb

Find parametric equations for the line described below.

3) The line through the point P(3, −4, 5) parallel to the vector $-8\mathbf{i} + 4\mathbf{j} - 4\mathbf{k}$ 3) _____

A) $x = 8t + 3$, $y = 4t - 4$, $z = -4t + 5$ B) $x = -8t + 3$, $y = 4t - 4$, $z = -4t + 5$

C) $x = 8t - 3$, $y = 4t + 4$, $z = -4t - 5$ D) $x = -8t - 3$, $y = 4t + 4$, $z = -4t - 5$

Calculate the requested distance.

4) The distance from the point S(−6, −6, 9) to the plane $2x + 2y + z = 6$ 4) _____

A) $\frac{7}{3}$ B) 7 C) 9 D) 3

Write the equation for the plane.

5) The plane through the point P(−6, −6, −5) and normal to $\mathbf{n} = -8\mathbf{i} - 7\mathbf{j} + 4\mathbf{k}$. 5) _____

A) $8x + 7y - 4z = 26$ B) $6x + 6y - 5z = 26$

C) $-6x - 6y + 5z = 26$ D) $-8x - 7y + 4z = 70$

Find the intersection of the line and the plane.

6) $x = 7 + 8t$, $y = -9 + 2t$, $z = 3 + 8t$; $2x + 8y + 7z = 7$ 6) _____

A) (15, −7, 11) B) (−1, −11, −5) C) $(11, -8, 7)$ D) $\left(3, -\frac{20}{11}, -3\right)$

The position vector of a particle is r(t). Find the requested vector.

7) The acceleration at t = 3 for $\mathbf{r}(t) = (5t - 2t^4)\mathbf{i} + (10 - t)\mathbf{j} + (8t^2 - 2t)\mathbf{k}$ 7) _____

A) $\mathbf{a}(3) = -216\mathbf{i} + 16\mathbf{k}$ B) $\mathbf{a}(3) = 216\mathbf{i} + 16\mathbf{k}$

C) $\mathbf{a}(3) = -216\mathbf{i} - \mathbf{j} + 16\mathbf{k}$ D) $\mathbf{a}(3) = -54\mathbf{i} + 16\mathbf{k}$

BONUS II Write the equation for the plane.

8) The plane through the point A(5, 7, 4) perpendicular to the vector from the origin to A. 8) _____

A) $5x + 7y + 4z = \sqrt{90}$ B) $5x + 7y + 4z = -90$

C) $5x + 7y + 4z = 90$ D) $5x + 7y + 4z = 16$

Solve the problem.

9) Find an equation for the level surface of the function $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$ that passes through the point $(4, 3, 12)$. 9) _____

A) $x^2 + y^2 + z^2 = 13$ B) $x + y + z = \pm 13$

C) $x^2 + y^2 + z^2 = 169$ D) $x + y + z = 13$

Find f_x, f_y, and f_z.

10) $f(x, y, z) = \dfrac{\cos y}{xz^2}$ 10) _____

A) $f_x = \dfrac{\cos y}{z^2}$; $f_y = \dfrac{\sin y}{xz^2}$; $f_z = \dfrac{2 \cos y}{xz}$ B) $f_x = -\dfrac{\cos y}{z^2}$; $f_y = -\dfrac{\sin y}{xz^2}$; $f_z = -\dfrac{2 \cos y}{xz}$

C) $f_x = \dfrac{\cos y}{x^2z^2}$; $f_y = \dfrac{\sin y}{xz^2}$; $f_z = \dfrac{2 \cos y}{xz^3}$ D) $f_x = -\dfrac{\cos y}{x^2z^2}$; $f_y = -\dfrac{\sin y}{xz^2}$; $f_z = -\dfrac{2 \cos y}{xz^3}$

Solve the problem.

11) Evaluate $\dfrac{dw}{dt}$ at $t = 3\pi$ for the function $w = x^2 - y^2 - 5x$; $x = \cos t$, $y = \sin t$. 11) _____

A) −9 B) −7 C) 0 D) −3

Compute the gradient of the function at the given point.

12) $f(x, y, z) = 2xy^3z^2$, (2, 8, 4) 12) _____

A) $\nabla f = 16{,}384\mathbf{i} + 8192\mathbf{j} + 24{,}576\mathbf{k}$ B) $\nabla f = 8192\mathbf{i} + 8192\mathbf{j} + 6144\mathbf{k}$

C) $\nabla f = 16{,}384\mathbf{i} + 12{,}288\mathbf{j} + 16{,}384\mathbf{k}$ D) $\nabla f = 8192\mathbf{i} + 12{,}288\mathbf{j} + 4096\mathbf{k}$

Provide an appropriate response.

13) Find the direction in which the function is increasing most rapidly at the point P_0. 13) _____

$f(x, y, z) = xy - \ln(z)$, $P_0(2, -2, 2)$

A) $\dfrac{1}{\sqrt{33}}(-4i - 4j + k)$ B) $\dfrac{1}{\sqrt{33}}(-4i + 4j - k)$

C) $\dfrac{33}{\sqrt{33}}(-4i + 4j - k)$ D) $\dfrac{1}{33}(-4i + 4j - k)$

Find the derivative of the function at P_0 in the direction of u.

14) $f(x, y, z) = 4x + 3y + 9z$, $P_0(2, -8, 6)$, $\mathbf{u} = 3\mathbf{i} - 6\mathbf{j} - 2\mathbf{k}$ 14) _____

A) $-\dfrac{24}{7}$ B) $-\dfrac{33}{7}$ C) $-\dfrac{12}{7}$ D) $-\dfrac{15}{7}$

Find the linearization of the function at the given point.

15) $f(x, y, z) = 6xy + 2yz - 9zx$ at (1, 1, 1) 15) _____

A) $L(x, y, z) = -3x + 8y - 7z + 2$ B) $L(x, y, z) = 6x + 2y - 9z + 1$

C) $L(x, y, z) = 6x + 2y - 9z + 2$ D) $L(x, y, z) = -3x + 8y - 7z + 1$

Find all the local maxima, local minima, and saddle points of the function.

16) $f(x, y) = x^3 + y^3 - 300x - 75y - 3$ 16) _____

A) $f(10, -5) = -1753$, saddle point; $f(-10, 5) = 1747$, saddle point

B) $f(-10, -5) = 2247$, local maximum; $f(10, 5) = -2253$, local minimum

C) $f(10, 5) = -2253$, local minimum; $f(10, -5) = -1753$, saddle point; $f(-10, 5) = 1747$, saddle point; $f(-10, -5) = 2247$, local maximum

D) $f(-10, -5) = 2247$, local maximum

17) **Find the extreme values of the function subject to the given constraint.** 17) _____

$f(x, y) = xy, \quad x^2 + y^2 = 800$

A) Maximum: 400 at (20, 20) and (−20, −20); minimum: −400 at (20, −20) and (−20, 20)

B) Maximum: 400 at (20, 20); minimum: −400 at (−20, −20)

C) Maximum: 400 at (20, 20); minimum: 0 at (0, 0)

D) Maximum: 400 at (20, −20) and (−20, 20); minimum: −400 at (20, 20) and (−20, −20)

18) **BONUS I** $f(x, y) = x^2 + y^2, \quad xy^2 = 686$ 18) _____

A) Maximum: none; minimum: 147 at $(7, \pm 7\sqrt{2})$

B) Maximum: none; minimum: 0 at (0, 0)

C) Maximum: 147 at $(7, 7\sqrt{2})$; minimum: −147 at $(7, -7\sqrt{2})$

D) Maximum: 147 at $(7, \pm 7\sqrt{2})$; minimum: 0 at (0, 0)

Evaluate the integral.

19) $\int_1^3 \int_0^y x^2y^2 \, dx \, dy$ 19) _____

A) $\frac{350}{3}$ B) $\frac{364}{9}$ C) $\frac{350}{9}$ D) $\frac{364}{3}$

Write an equivalent double integral with the order of integration reversed.

20) $\int_0^9 \int_0^x dy \, dx$ 20) _____

A) $\int_0^9 \int_9^y dx \, dy$ B) $\int_0^x \int_0^9 dx \, dy$

C) $\int_0^9 \int_{-9}^y dx \, dy$ D) $\int_0^9 \int_y^9 dx \, dy$

Find the volume of the indicated region.

21) the region under the surface $z = x^2 + y^4$, and bounded by the planes $x = 0$ and $y = 25$ and the cylinder $y = x^2$ 21) _____

A) $\frac{292{,}982{,}500}{33}$ B) $\frac{11{,}732{,}500}{33}$ C) $\frac{2{,}357{,}500}{33}$ D) $\frac{58{,}607{,}500}{33}$

22) the region bounded by the paraboloid $z = 100 - x^2 - y^2$ and the xy−plane 22) _____

A) $\frac{10000}{3}\pi$ B) $\frac{5000}{3}\pi$ C) 5000π D) 2500π

Solve the problem.

23) Write an iterated triple integral in the order dx dy dz for the volume of the tetrahedron cut from the first octant by the plane $\frac{x}{9} + \frac{y}{4} + \frac{z}{6} = 1$. 23) _____

A) $\int_0^6 \int_0^{1 - y/4} \int_0^{1 - y/4 - z/6} dx\, dy\, dz$

B) $\int_0^6 \int_0^{9(1 - y/4)} \int_0^{9(1 - y/4 - z/6)} dx\, dy\, dz$

C) $\int_0^6 \int_0^{1 - z/6} \int_0^{1 - y/4 - z/6} dx\, dy\, dz$

D) $\int_0^6 \int_0^{4(1 - z/6)} \int_0^{9(1 - y/4 - z/6)} dx\, dy\, dz$

Evaluate the integral.

24) $\int_{-1}^1 \int_0^5 \int_0^1 (x^2 + y^2 + z^2)\, dx\, dy\, dz$ 24) _____

A) 126 B) 90 C) 23.2 D) 124

Find the volume of the indicated region.

25) the region bounded by the coordinate planes, the parabolic cylinder $z = 4 - x^2$, and the plane $y = 5$ 25) _____

A) 80 B) $\frac{80}{3}$ C) 60 D) 30

26) the region bounded by the paraboloid $z = x^2 + y^2$ and the cylinder $x^2 + y^2 = 16$ 26) _____

A) $\frac{256}{3}\pi$ B) 128π C) $\frac{1024}{3}\pi$ D) 384π

Evaluate the line integral along the curve C.

27) $\int_C \frac{x + y + z}{5}\, ds$, C is the curve $\mathbf{r}(t) = 4t\mathbf{i} + (8 \cos \frac{3}{8}t)\mathbf{j} + (8 \sin \frac{3}{8}t)\mathbf{k}$, $0 \le t \le \frac{8}{3}\pi$ 27) _____

A) $\frac{128}{9}\pi$ B) $\frac{128}{9}\pi^2 + \frac{256}{3}$ C) $\frac{128}{9} + \frac{128}{3}$ D) $\frac{128}{9}\pi^2 + \frac{128}{3}$

28) $\int_C (y + z)\, ds$, C is the path from (0, 0, 0) to (−3, 3, 1) given by: 28) _____

C_1: $\mathbf{r}(t) = -3t^2\mathbf{i} + 3t\mathbf{j}$, $0 \le t \le 1$

C_2: $\mathbf{r}(t) = -3\mathbf{i} + 3\mathbf{j} + (t-1)\mathbf{k}$, $1 \le t \le 2$

A) $\frac{25}{2}$ B) $\frac{13}{12}$ C) $\frac{15}{4}\sqrt{5} - \frac{11}{4}$ D) $\frac{15}{4}\sqrt{5} + \frac{11}{4}$

29) $\int_C \frac{1}{x^2 + y^2 + z^2}\,ds$, C is the path given by: 29) _____

C_1: $\mathbf{r}(t) = (5\cos t)\mathbf{i} + (5\sin t)\mathbf{j}$ from (5, 0, 0) to (0, 5, 0)

C_2: $\mathbf{r}(t) = (5\sin t)\mathbf{j} + (5\cos t)\mathbf{k}$ from (0, 5, 0) to (0, 0, 5)

C_3: $\mathbf{r}(t) = (5\sin t)\mathbf{i} + (5\cos t)\mathbf{k}$ from (0, 0, 5) to (5, 0, 0)

A) $\frac{3}{10}\pi$ B) $\frac{\pi}{10}$ C) $-\frac{3}{10}\pi$ D) 0

Find the work done by F over the curve in the direction of increasing t.

30) $\mathbf{F} = -6y\mathbf{i} + 6x\mathbf{j} + 9z^3\mathbf{k}$; C: $\mathbf{r}(t) = \cos t\mathbf{i} + \sin t\mathbf{j}$, $0 \le t \le 7$ 30) _____

A) W = 42 B) W = 0 C) W = 147 D) W = 84

Calculate the flux of the field F across the closed plane curve C.

31) $\mathbf{F} = y^3\mathbf{i} + x^2\mathbf{j}$; the curve C is the closed counterclockwise path formed from the semicircle $\mathbf{r}(t) = 5\cos t\mathbf{i} + 5\sin t\mathbf{j}$, $0 \le t \le \pi$, and the straight line segment from (−5, 0) to (5, 0) 31) _____

A) $-\frac{50}{3}$ B) $\frac{50}{3}$ C) 0 D) $\frac{100}{3}$

Calculate the circulation of the field F around the closed curve C.

32) $\mathbf{F} = xy\mathbf{i} + 3\mathbf{j}$, curve C is $\mathbf{r}(t) = 2\cos t\mathbf{i} + 2\sin t\mathbf{j}$, $0 \le t \le 2\pi$ 32) _____

A) $\frac{10}{3}$ B) 6 C) $\frac{26}{3}$ D) 0

Calculate the flow in the field F along the path C.

33) $\mathbf{F} = y^2\mathbf{i} + z\mathbf{j} + x\mathbf{k}$; C is the curve $\mathbf{r}(t) = (2 + 2t)\mathbf{i} + 3t\mathbf{j} - 3t\mathbf{k}$, $0 \le t \le 1$ 33) _____

A) 39 B) $\frac{9}{2}$ C) $-\frac{15}{2}$ D) −3

Find the gradient field of the function.

34) $f(x, y, z) = x^7y^8 + \frac{x^3}{z^4}$ 34) _____

A) $\nabla f = (7x^6 + 3x^2)\mathbf{i} + 8y^7\mathbf{j} - \frac{4}{z^5}\mathbf{k}$

B) $\nabla f = 7x^6y^8\mathbf{i} + 8x^7y^7\mathbf{j} - \frac{4x^7}{z^5}\mathbf{k}$

C) $\nabla f = \left(7x^6y^8 + \frac{3x^2}{z^4}\right)\mathbf{i} + 8x^7y^7\mathbf{j} - \frac{4x^3}{z^5}\mathbf{k}$

D) $\nabla f = (7x^6 + 3x^2)\mathbf{i} + 8y^7\mathbf{j} + \frac{4}{z^5}\mathbf{k}$

Find the potential function f for the field F.

35) $\mathbf{F} = \frac{1}{z}\mathbf{i} - 6\mathbf{j} - \frac{x}{z^2}\mathbf{k}$ 35) _____

A) $f(x, y, z) = \frac{x}{z} - 6y + C$

B) $f(x, y, z) = \frac{x}{z} + C$

C) $f(x, y, z) = \frac{2x}{z} - 6y + C$

D) $f(x, y, z) = \frac{x}{z} - 6 + C$

Evaluate the work done between point 1 and point 2 for the conservative field F.

36) $\mathbf{F} = 6 \sin 6x \cos 4y \cos 6z\mathbf{i} + 4 \cos 6x \sin 4y \cos 6z\mathbf{j} + 6 \cos 6x \cos 4y \sin 6z\mathbf{k}$; $P_1(0, 0, 0)$, $P_2\left(\frac{1}{3}\pi, \frac{1}{2}\pi, \frac{\pi}{6}\right)$ 36) _____

A) W = 1 B) W = 0 C) W = −2 D) W = 2

Using Green's Theorem, find the outward flux of F across the closed curve C.

37) $\mathbf{F} = \sin 10y\mathbf{i} + \cos 4x\mathbf{j}$; C is the rectangle with vertices at (0, 0), $\left(\frac{\pi}{10}, 0\right)$, $\left(\frac{\pi}{10}, \frac{\pi}{4}\right)$, and $\left(0, \frac{\pi}{4}\right)$ 37) _____

A) $-\frac{2}{5}\pi$ B) 0 C) $-\frac{1}{5}\pi$ D) $\frac{1}{5}\pi$

Calculate the flux of the field F across the closed plane curve C.

38) $\mathbf{F} = x\mathbf{i} + y\mathbf{j}$; the curve C is the counterclockwise path around the circle $x^2 + y^2 = 121$ 38) _____

A) 242π B) 22π C) 0 D) 484π

39) $\mathbf{F} = y^3\mathbf{i} + x^3\mathbf{j}$; the curve C is the closed counterclockwise path formed from the semicircle $\mathbf{r}(t) = 2 \cos t\mathbf{i} + 2 \sin t\mathbf{j}$, $0 \le t \le \pi$, and the straight line segment from (−2, 0) to (2, 0) 39) _____

A) 4 B) 8 C) - 4 D) 0

40) $\mathbf{F} = x^2\mathbf{i} + y^2\mathbf{j}$; the curve C is the closed counterclockwise path around the triangle with vertices at (0, 0), (3, 0), and (0, 5) 40) _____

A) − 10 B) 120 C) 40 D) 0

41) $\mathbf{F} = (x+y)\mathbf{i} + xy\mathbf{j}$; the curve C is the closed counterclockwise path around the rectangle with vertices at (0, 0), (2, 0), (2, 9), and (0, 9) 41) _____

A) 54 B) 36 C) 81 D) 117

Calculate the circulation of the field F around the closed curve C.

42) $\mathbf{F} = x^2y^3\mathbf{i} + x^2y^3\mathbf{j}$; curve C is the counterclockwise path around the rectangle with vertices at (0, 0), (4, 0), (4, 2), and (0, 2) 42) _____

A) 0 B) $-\frac{320}{3}$ C) $\frac{704}{3}$ D) −256

43) $\mathbf{F} = xy^2\mathbf{i} + x^2y\mathbf{j}$; curve C is the counterclockwise path around $C_1 \cup C_2$: C_1: $\mathbf{r}(t)$ 2 cos $t\mathbf{i}$ + 2 sin $t\mathbf{j}$, $0 \le t \le \pi$ 43) _____

C_2: $\mathbf{r}(t) = t\mathbf{i}$, $-2 \le t \le 2$

A) 0 B) 4 C) 2 D) 8

44) $\mathbf{F} = (-x - y)\mathbf{i} + (x + y)\mathbf{j}$, curve C is the counterclockwise path around the circle with radius 4 centered at (10, 3) 44) _____

A) 64π B) $32(1 + \pi) + 208$ C) $32(1 + \pi)$ D) 32π

45) $\mathbf{F} = y^3\mathbf{i} + x^2\mathbf{j}$; curve C is the counterclockwise path around the triangle with vertices at (0, 0), (3, 0), and (0, 5) 45) _____

A) 0 B) $\frac{435}{4}$ C) $\frac{315}{4}$ D) $-\frac{315}{4}$

Answer Key
Testname: MATH 2013 FINAL PRACTICE - UPDATE

1) A
2) A
3) B
4) B
5) D
6) C
7) A
8) C
9) C
10) D
11) C
12) C
13) B
14) A
15) D
16) C
17) A
18) A
19) B
20) D
21) A
22) C
23) D
24) B
25) B
26) B
27) D
28) D
29) B
30) A
31) C
32) D
33) C
34) C
35) A
36) D
37) B
38) A
39) D
40) C
41) B
42) B
43) A
44) D
45) D