This print-out should have 6 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Find $\lim\limits_{(x,y)\to(6,-2)} \left(x^5 + 3x^3y - 6xy^2\right)$.

1. 6336 **correct**

2. 8928

3. 6624

4. 9216

5. 6192

Explanation:

002 10.0 points

Find $\lim\limits_{(x,y)\to(6,2)} xy\cos(x-3y)$.

1. -12

2. 2

3. 12 **correct**

4. 0

5. 6

Explanation:

003 10.0 points

Suppose that $\lim\limits_{(x,y)\to(3,7)} f(x,y) = 2$.

What is the value of $f(3,7)$ if f is continuous?

1. 7

2. 9

3. 5

4. 3

5. 2 **correct**

Explanation:

004 10.0 points

Determine the set of points at which the function

$$f(x,y,z) = \frac{xyz}{8x^2 + 2y^2 - z}$$

is continuous.

1. $\left\{(x,y,z)|z \neq -8x^2 - 2y^2\right\}$

2. $\left\{(x,y,z)|z \neq 8x^2 + 2y^2, xyz > 0\right\}$

3. $\left\{(x,y,z)|z \neq 8x^2 + 2y^2\right\}$ **correct**

4. $\left\{(x,y,z)|xyz > 0\right\}$

5. $\left\{(x,y,z)|z \neq 8x^2 + 2y^2, xyz < 0\right\}$

Explanation:

005 10.0 points

Determine the set of points at which the function

$$f(x,y,z) = \sqrt{8x + 4y + 7z}$$

is continuous

1. $\left\{(x,y,z)|8x + 4y + 7z \neq 0\right\}$

2. $\left\{(x,y,z)|x \geq 0, y \geq 0, z \geq 0\right\}$

3. $\left\{(x,y,z)|8x + 4y + 7z > 0\right\}$

4. $\left\{(x,y,z)|8x + 4y + 7z \geq 0\right\}$ **correct**

5. $\Big\{(x, y, z)|xyz \geq 0\Big\}$

Explanation:

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006 10.0 points

Find $\displaystyle\lim_{(x,y)\to(0,0)} \frac{4\left(x^2+y^2\right)}{\sqrt{x^2+y^2+9}-3}$, if it exists.

1. 4

2. 12

3. The limit does not exist.

4. 24 **correct**

5. 0

Explanation:
Rationalize the denominator:

$$\frac{4\left(x^2+y^2\right)}{\sqrt{x^2+y^2+9}-3}\left(\frac{\sqrt{(x^2+y^2+3^2)}+3}{\sqrt{(x^2+y^2+3^2)}+3}\right)$$

which now simplifies to x^2+y^2:

$$\frac{4\left(x^2+y^2\right)[\sqrt{(x^2+y^2+3^2)}+3]}{(x^2+y^2)}$$

That factor also appears in the numerator, so they cancel on the domain of the original function.

Now the resulting function has a continuous numerator (for (x,y) near (0,0) but not equal to it) and continuous denominator WHICH WILL NOT EQUAL 0.

Since the ratio of two continuous functions is continuous (if the denominator does not approach 0), we conclude that the limit as (x,y) approaches the origin is the value of the rewritten function at (0,0):

$$\begin{aligned} 4(\sqrt{(0^2+0^2+3^2)}+3) &= 4(\sqrt{3^2}+3) \\ &= 24 \end{aligned}$$