

Math 126
Business Calculus
Test 1 Review

1) Simplify $(4y^3)(-2y^{12})$

$$\begin{aligned} &(4y^3)(-2y^{12}) \\ &-8y^{3+12} \\ &-8y^{15} \end{aligned}$$

2) Simplify $8^{\frac{5}{3}}$

$$\begin{aligned} &8^{\frac{5}{3}} \\ &(\sqrt[3]{8})^5 \\ &2^5 \end{aligned}$$

3) Simplify $(2x^3y^5)^4$

$$\begin{aligned} &(2x^3y^5)^4 \\ &2^4(x^3)^4(y^5)^4 \\ &16x^{12}y^{20} \end{aligned}$$

4) Simplify $\left(\frac{a}{2b}\right)^4$

$$\begin{aligned} &\left(\frac{a}{2b}\right)^4 \\ &\frac{a^4}{(2b)^4} \\ &\frac{a^4}{16b^4} \end{aligned}$$

5) Factor $4m^6n^4 + 8m^4n^3 + 16m^2n^2$

$$\begin{aligned} &4m^6n^4 + 8m^4n^3 + 16m^2n^2 \\ &4m^2n^2(m^4n^2 + 2m^2n + 4) \end{aligned}$$

6) Factor $16x^2 - 25y^2$

$$\begin{aligned} &16x^2 - 25y^2 \\ &(4x - 5y)(4x + 5y) \end{aligned}$$

7) Factor $m^2 - 9m + 20$

$$\begin{aligned} &m^2 - 9m + 20 \\ &(m - 4)(m - 5) \end{aligned}$$

8) Factor $27a^3 - 8b^3$

$$\begin{aligned} &27a^3 - 8b^3 \\ &(3a)^3 - (2b)^3 \\ &(3a - 2b)((3a)^2 + (3a)(2b) + (2b)^2) \\ &(3a - 2b)(9a^2 + 6ab + 4b^2) \end{aligned}$$

9) Factor $x^3 + 8$

$$\begin{aligned} &x^3 + 8 \\ &x^3 + 2^3 \\ &(x + 2)(x^2 - 2x + 2^2) \\ &(x + 2)(x^2 - 2x + 4) \end{aligned}$$

10) Solve $x^3 - 5x^2 - 2x + 10 = 0$

$$\begin{aligned} &x^3 - 5x^2 - 2x + 10 = 0 \\ &x^2(x - 5) - 2(x - 5) = 0 \\ &(x^2 - 2)(x - 5) = 0 \\ &(x^2 - 2)(x - 5) = 0 \\ &x^2 - 2 = 0 \text{ or } x - 5 = 0 \\ &x^2 = 2 \text{ or } x = 5 \\ &\sqrt{x^2} = \sqrt{2} \\ &x = \pm\sqrt{2} \end{aligned}$$

11) Solve $x^2 - 16x + 64 = 0$

$$\begin{aligned}x^2 - 16x + 64 &= 0 \\(x - 8)(x - 8) &= 0 \\x - 8 = 0 \text{ or } x - 8 &= 0 \\x = 8 \text{ or } x &= 8\end{aligned}$$

12) Solve $t^2 - 4t - 12 = 0$

$$\begin{aligned}t^2 - 4t - 12 &= 0 \\(t - 6)(t + 2) &= 0 \\t - 6 = 0 \text{ or } t + 2 &= 0 \\t = 6 \text{ or } t &= -2\end{aligned}$$

13) Solve $n^2 - 16 = 0$

$$\begin{aligned}n^2 - 16 &= 0 \\(n + 4)(n - 4) &= 0 \\n - 4 = 0 \text{ or } n + 4 &= 0 \\n = 4 \quad n &= -4\end{aligned}$$

14) Solve $4p^2 - 12p = 0$

$$\begin{aligned}4p^2 - 12p &= 0 \\4p(p - 3) &= 0 \\4p = 0 \text{ or } p - 3 &= 0 \\p = 0 \text{ or } p &= 3\end{aligned}$$

15) Find the distance and midpoint between the points $(-3,3)$ and $(5,7)$

$$d = \sqrt{(5 - (-3))^2 + (7 - 3)^2} = \sqrt{8^2 + 4^2} = \sqrt{64 + 16} = \sqrt{80} \approx 8.9$$

16) Find the slope of a line passing through $(3,2)$ and $(2,5)$

$$m = \frac{5 - 2}{2 - 3} = \frac{3}{-1} = -3$$

- 17) Find the equation of line in slope-intercept form, given it has a slope of $\frac{3}{4}$ and a y-intercept of 2.

$$y = mx + b \Rightarrow y = \frac{3}{4}x - 2$$

- 18) Find the equation of line in slope-intercept form given that it passes through the points (1,-1) and (3,3).

$$m = \frac{3 - (-1)}{3 - 1} = \frac{4}{2} = 2$$

$$y - y_1 = m(x - x_1)$$

$$y - (-1) = 2(x - 1)$$

$$y + 1 = 2x - 2$$

$$y = 2x - 3$$

- 19) Determine if the lines are parallel or perpendicular given the equations of the lines

$$3x + 4y = 12$$

$$6x + 8y = 16$$

$$3x + 4y = 12$$

$$4y = -3x + 12$$

$$\frac{4y}{4} = \frac{-3x}{4} + \frac{12}{4}$$

$$y = -\frac{3}{4}x + 3$$

$$m = -\frac{3}{4}$$

$$6x + 8y = 16$$

$$8y = -6x + 16$$

$$\frac{8y}{8} = -\frac{6}{8}x + \frac{16}{8}$$

$$y = -\frac{3}{4}x + 2$$

$$m = -\frac{3}{4}$$

The lines are parallel

20) Find the value of x so that the distance between $(1,0)$ and $(x,-4)$ is 5 units.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$5 = \sqrt{(x-1)^2 + (-4-0)^2}$$

$$5 = \sqrt{(x-1)^2 + 16}$$

$$5^2 = \left(\sqrt{(x-1)^2 + 16}\right)^2$$

$$25 = (x-1)^2 + 16$$

$$25 - 16 = (x-1)^2 = 16 - 16$$

$$9 = (x-1)^2$$

$$\sqrt{9} = \sqrt{(x-1)^2}$$

$$\pm 3 = x - 1$$

$$x = \pm 3 + 1$$

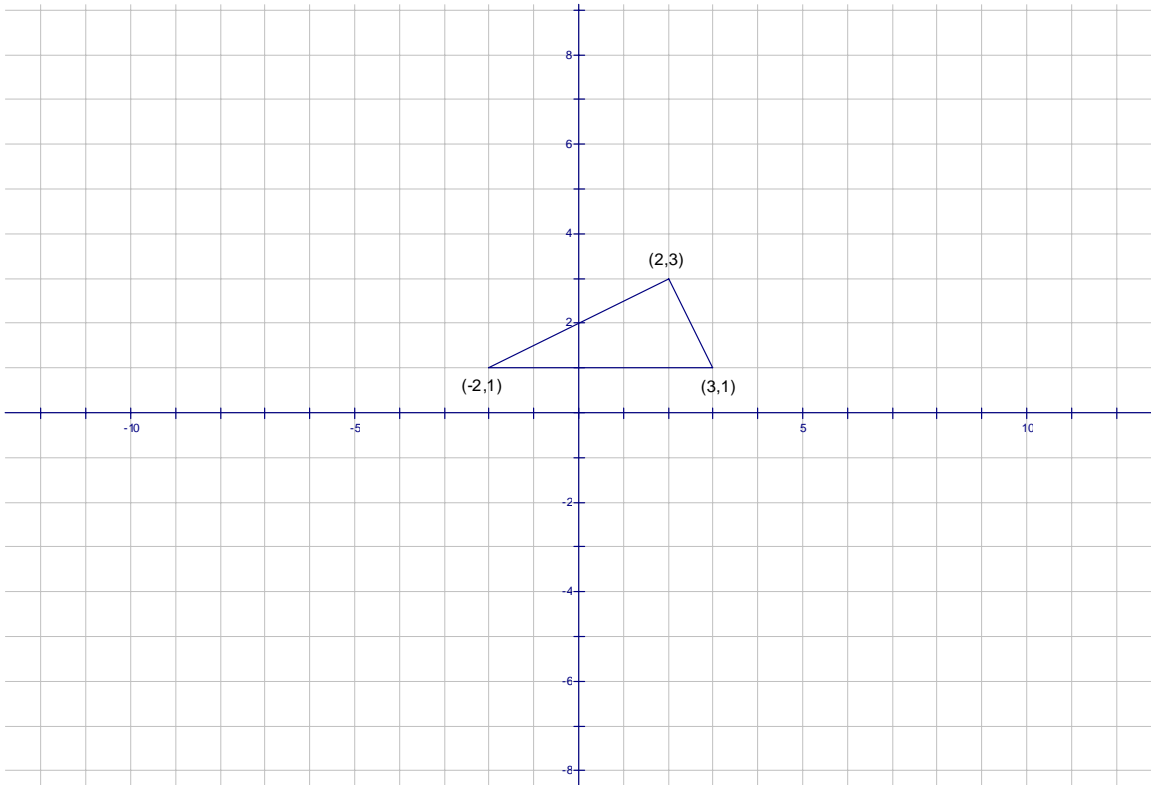
$$\{-2, 4\}$$

21) Express the inequality in interval notation.

a) $x > -2$ $(-2, \infty)$

b) $0 \leq x \leq 6$ $[0, 6]$

22) Show that $\triangle ABC$ is a right triangle, given that $A = (-2,1)$, $B = (2,3)$, and $C = (3,1)$



$$d(AB) = \sqrt{(3-(-2))^2 + (2-(-2))^2} = \sqrt{2^2 + 4^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

$$d(BC) = \sqrt{(1-3)^2 + (3-2)^2} = \sqrt{2^2 + 1^2} = \sqrt{4+1} = \sqrt{5}$$

$$d(AC) = \sqrt{(3-(-2))^2 + (1-1)^2} = \sqrt{5^2 + 0^2} = \sqrt{25} = 5$$

$$c^2 = a^2 + b^2$$

$$5^2 = (\sqrt{20})^2 + (\sqrt{5})^2$$

$$25 = 20 + 5$$

$$25 = 25$$

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9)

$$x^2 - 4x + 4$$
$$(x - 2)(x + 2)$$

11)

$$4x^2 - 4x + 1$$
$$(2x - 1)(2x + 1)$$

19) **Omit**

20)

$$x^4 - 16$$
$$(x^2 - 4)(x^2 + 4)$$
$$(x - 2)(x + 2)(x^2 + 4)$$

22)

$$y^3 - 64$$
$$y^3 - 4^3$$
$$(y - 4)(y^2 + 4y + 4^2)$$
$$(y - 4)(y^2 + 4y + 16)$$

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5)

$$d = \sqrt{(5-0)^2 + (2-0)^2} = \sqrt{5^2 + 2^2} = \sqrt{25+4} = \sqrt{29}$$

7)

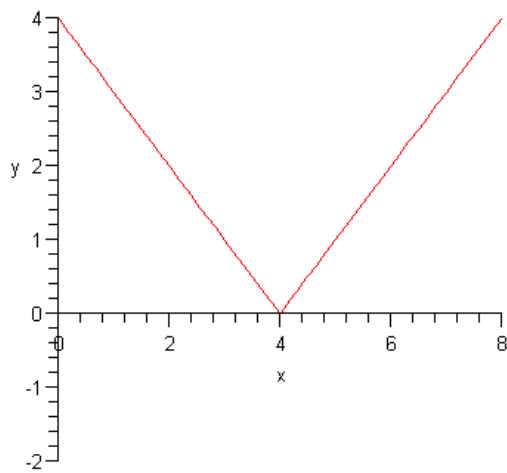
$$d = \sqrt{(-4-(-1))^2 + (6-3)^2} = \sqrt{(-5)^2 + 3^2} = \sqrt{25+9} = \sqrt{34}$$

9)

$$\left(\frac{5+9}{2}, \frac{6+2}{2}\right) = \left(\frac{14}{2}, \frac{8}{2}\right) = (7,4)$$

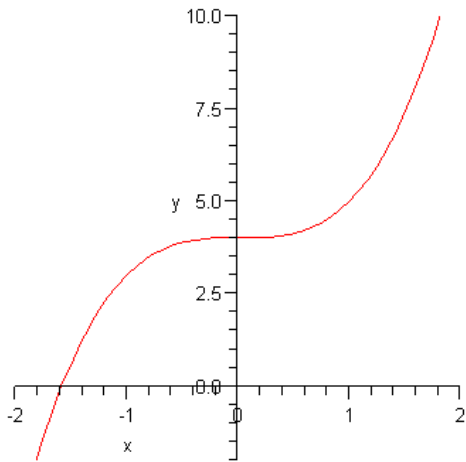
22)

Graph $y = |4 - x|$



24)

Graph $y = x^3 + 4$



47)

$$m = \frac{6-0}{7-0} = \frac{6}{7}$$

51)

(3, -1)

$$m = -2$$

$$y - (-1) = -2(x - 3)$$

$$y + 1 = -2x + 6$$

$$y = -2x + 5$$