

**Assessment# 1 -Chapter 1 & 2**

**Directions:** Provide complete responses to each question.

1. Write an equation of the line satisfying the following conditions. If possible, write your answer in the following form  $y = mx + b$ :
- Passing through the points (5, 3) and (7, 1)

$$y = -x + 8$$

- Horizontal and passing through the point (1.5, - 4)

$$y = -4$$

- Passing through the point (12, 2) that is (i) parallel to the line  $4y - 3x = 5$  and (ii) perpendicular to the line  $4y - 3x = 5$

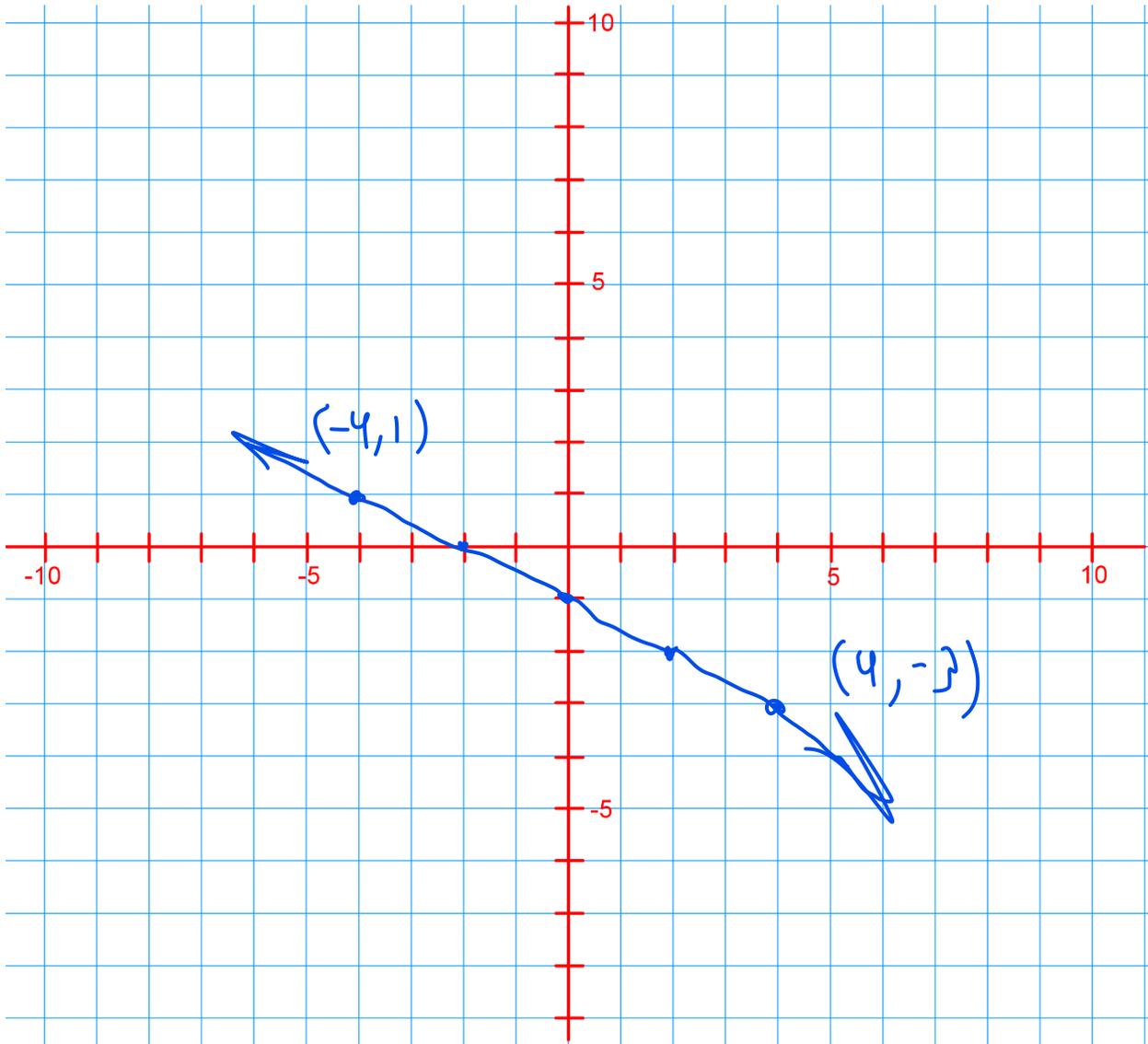
a)  $y = \frac{3}{4}x - 7$

b)  $y = -\frac{4}{3}x + 7$

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2. Sketch the following linear equation:  $x + 2y = -2$



3. Evaluate each expression without using a calculator:

a.  $4^{-2} \cdot 2^{-1}$

$$2^{-4} \cdot 2^{-1}$$
$$2^{-5}$$
$$\frac{1}{2^5} = \frac{1}{32}$$

b.  $\left[\left(\frac{2}{3}\right)^{-2}\right]^{-4}$

$$\left(\frac{2}{3}\right)^8$$
$$\left(\frac{2^8}{3^8}\right) = \frac{256}{6561}$$

c.  $\left(\frac{1}{32}\right)^{2/5}$

$$\left(\frac{1^{2/5}}{32^{2/5}}\right) = \frac{1}{4}$$

d.  $(-8)^{-1/3}$

$$= \frac{1}{-8^{1/3}} = -\frac{1}{2}$$
$$= \frac{1}{-2}$$

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4. Write each expression in power form  $ax^b$  for numbers, a and b.

a.  $\frac{4}{x^5}$

b.  $\frac{4}{\sqrt[3]{8x^4}}$

c.  $\frac{24}{(2\sqrt{x})^3}$

5. Solve each equation by factoring or the Quadratic Formula, as appropriate.

a.  $x^2 - 6x - 7 = 0$

$$\frac{-(-6) \pm \sqrt{(-6)^2 - 4 \cdot 1 \cdot (-7)}}{2 \cdot 1}$$

$$\sqrt{6^2 + 4 \cdot 1 \cdot 7}$$

$$\sqrt{6^2 + 28}$$

$$\sqrt{36 + 28}$$

$$\sqrt{64}$$

$$\sqrt{8^2} = 8$$

$$x_{1,2} = \frac{-(-6) \pm 8}{2 \cdot 1}$$

$$\frac{-(-6) + 8}{2 \cdot 1} = 7$$

$$\frac{-(-6) - 8}{2 \cdot 1} = -1$$

$$x = 7 \quad x = -1$$

b.  $x^2 + 2x = 15$

$$x^2 + 2x - 15 = 0$$

$$x_{1,2} = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-15)}}{2 \cdot 1}$$

$$\sqrt{2^2 - 4 \cdot 1 \cdot (-15)} = 8$$

$$x_{1,2} = \frac{-2 + 8}{2 \cdot 1}$$

$$x = \frac{-2 + 8}{2 \cdot 1} : 3$$

$$x = \frac{-2 - 8}{2 \cdot 1} : -5$$

$$x = 3$$
$$x = -5$$

c.  $2x^2 + 40 = 8x$

$$2x^2 + 40 - 8x = 0$$

$$2x^2 - 8x + 40 = 0$$

$$x_{1,2} = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \cdot 2 \cdot 40}}{2 \cdot 2}$$

$$\sqrt{(-8)^2 - 4 \cdot 2 \cdot 40} = 16i$$

$$x_{1,2} = \frac{-(-8) \pm 16i}{2 \cdot 2}$$

$$x = \frac{-(-8) + 16i}{2 \cdot 2} = 2 + 4i$$

$$x = \frac{-(-8) - 16i}{2 \cdot 2} = 2 - 4i$$

$$x = 2 + 4i$$
$$x = 2 - 4i$$

d.  $5x^2 - 50x = 0$

$$x_{1,2} = \frac{-(-50) \pm \sqrt{(-50)^2 - 4 \cdot 5 \cdot 0}}{2 \cdot 5}$$

$$\sqrt{(-50)^2 - 4 \cdot 5 \cdot 0} = 50$$

$$x_{1,2} = \frac{-(-50) \pm 50}{2 \cdot 5}$$

$$x = \frac{-(-50) + 50}{2 \cdot 5} = 10$$

$$x = \frac{-(-50) - 50}{2 \cdot 5} = 0$$

$$x = 10$$

$$x = 0$$

6. **Cost Functions** A lumberyard will deliver wood for \$4 per board foot plus a delivery charge of \$20. Find a function  $C(x)$  for the cost of having  $x$  board feet of lumber delivered.

$$C(x) = 4x + 20$$

7. For each function:  
a. Evaluate the given expression.  
b. Find the domain of the function.  
c. Find the range.

i.  $f(x) = \frac{1}{x+4}$        $f(-3)$

a.)  $f(-3) = \frac{1}{-3+4}$   
 $= \frac{1}{1}$   
 $f(-3) = 1$

b.)  $(-\infty, \infty)$

c.)  $y/y = 1$

ii.  $f(x) = \frac{12}{x(x+4)}$   $f(2)$

a.)  $f(2) = \frac{12}{2(2+4)}$   
 $= \frac{12}{12}$

$f(2) = 1$

b.)  $(-\infty, \infty)$

c.)

$y/y = 1$

iii.  $f(x) = 4^x$   $f(-\frac{1}{2})$

a.)  $f(-\frac{1}{2}) = 4^{-\frac{1}{2}}$   
 $= \frac{1}{4^{\frac{1}{2}}}$

$f(-\frac{1}{2}) = \frac{1}{2}$

b.)  $(-\infty, \infty)$

c.)

$y/y = \frac{1}{2}$

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iv.  $f(x) = 8^x$   $f\left(-\frac{1}{3}\right)$

a)  $f\left(-\frac{1}{3}\right) = 8^{-\frac{1}{3}}$   
 $= \frac{1}{8^{\frac{1}{3}}}$

b)  $(-\infty, \infty)$

c)  $y|y = \frac{1}{2}$

$f\left(-\frac{1}{3}\right) = \frac{1}{2}$

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8. Solve each equation by factoring.

a.  $x^5 + 2x^4 - 3x^3 = 0$

$$x^3(x-1)(x+3) = 0$$

$$x=0 \quad x-1=0 \quad x+3=0$$

$$x=0, x=1, x=-3$$

b.  $5x^3 - 20x = 0$

$$5x(x+2)(x-2) = 0$$

$$x=0 \quad x+2=0 \quad x-2=0$$

$$x=0, x=-2, x=2$$

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c.  $2x^5 - 50x^3 = 0$

$$2x^3(x+5)(x-3) = 0$$

$$x=0, x+5=0, x-3=0$$

$$x=0, x=-5, x=3$$

d.  $3x^{\frac{5}{2}} - 6x^{\frac{3}{2}} = 9x^{\frac{1}{2}}$

$$3x^{\frac{5}{2}} - 6x^{\frac{3}{2}} - 9x^{\frac{1}{2}} = 0$$

$$3x^{\frac{1}{2}}(x+1)(x-3) = 0$$

$$x^{\frac{1}{2}} = 0, x+1=0, x-3=0$$

$$x=0, x=-1, x=3$$

$$x=0, x=3$$

9. For each pair of functions  $f(x)$  and  $g(x)$ , find

- a.  $f(g(x))$
- b.  $g(f(x))$
- c.  $f(f(x))$

i.  $f(x) = x^5$     $g(x) = 7x - 1$

<p>a) <math display="block">\frac{f(7x-1)}{7x-1} = \frac{(7x-1)^5}{7x-1}</math></p> <p style="text-align: center;"><math>f = (7x-1)^4</math></p>	<p>b) <math display="block">g(x^5) = 7(x^5) - 1</math></p> <p><math>x^5 g - 7x^5 = -1</math></p> <p><math>x^5(g-7) = -1</math></p> <p style="text-align: center;"><math>x = \frac{1}{\sqrt[5]{g-7}}</math></p>	<p>c) <math>f(x^5) = x^5</math></p> <p><math>x^5 f = x^5</math></p> <p><math>x^5 f - x^5 = 0</math></p> <p><math>x^5(f-1) = 0</math></p> <p style="text-align: center;"><math>x^5 = 0</math></p> <p style="text-align: center;"><math>x = 0</math></p>
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ii.  $f(x) = \frac{1}{x}$     $g(x) = x^2 + 1$

<p>a) <math>f(x^2+1) = \frac{1}{x^2+1}</math></p> <p><math>f(x^2+1)(x^2+1) = \frac{1}{x^2+1}(x^2+1)</math></p> <p style="text-align: center;"><math>f(x^2+1)^2 = 1</math></p>	<p>b) <math>g\left(\frac{1}{x}\right) = \left(\frac{1}{x}\right)^2 + 1</math></p> <p><math>xg = 1 + x^2</math></p> <p style="text-align: center;"><math>x = \frac{g + \sqrt{g^2 - 4}}{2}</math></p> <p style="text-align: center;"><math>x = \frac{g - \sqrt{g^2 - 4}}{2}</math></p>	<p>c) <math>f\left(\frac{1}{x}\right) = \frac{1}{\frac{1}{x}}</math></p>
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10. Find the following limits without using a graphing calculator or making tables.

a.  $\lim_{x \rightarrow 3} (4x^2 - 10x + 2)$

$$= (4 \cdot 3^2 - 10 \cdot 3 + 2)$$

$$= (4 \cdot 9 - 30 + 2)$$

$$= 36 - 30 + 2$$

$$6 + 2 = \boxed{8}$$

b.  $\lim_{x \rightarrow 5} \left( \frac{3x^2 - 5x}{7x - 10} \right)$

$$= \frac{3 \cdot 5^2 - 5 \cdot 5}{7 \cdot 5 - 10}$$

$$= \frac{75 - 25}{35 - 10}$$

$$= \frac{50}{25}$$

$$= \boxed{2}$$

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c.  $\lim_{x \rightarrow 1} \left( \frac{x-1}{x^2+x-2} \right)$

$$\lim_{x \rightarrow 1} \left( \frac{1}{1+2} \right)$$

$$\lim_{x \rightarrow 1} = \frac{1}{3}$$

d.  $\lim_{h \rightarrow 0} \left( \frac{5x^4h - 9xh^2}{h} \right)$

$$= x(5x^3 - 9h)$$

$$\lim_{h \rightarrow 0} x(5x^3 - 9h)$$

$$= x(5x^3 - 9 \cdot 0)$$

$$\lim_{h \rightarrow 0} = 5x^4$$

11. Find  $f'(x)$  by using the definition of the derivative.

*Note: Use the Limit of Definition of Derivative*

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

a.  $f(x) = 2x - 7$

$$\lim_{h \rightarrow 0} \frac{((2x-7)+h) - 2x-7}{h}$$

b.  $f(x) = x^2 + 8x - 9$

$$\lim_{h \rightarrow 0} \frac{((x^2+8x-9)+h) - x^2+8x-9}{h}$$

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c.  $f(x) = x^3 + 2x^2 - 4x + 6$

d.  $f(x) = \frac{1}{x^2}$

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12. Find the derivative of the following functions using any method:

a.  $f(x) = x^5 \cdot x^{\frac{1}{2}}$

$$f'(x) = \frac{d}{dx} (x^5 \cdot x^{\frac{1}{2}})$$

$$f'(x) = \frac{d}{dx} (x^{\frac{11}{2}})$$

$$f'(x) = \frac{11}{2} x^{\frac{9}{2}}$$

$$f'(x) = \frac{11x^4\sqrt{x}}{2}$$

b.  $f(x) = \frac{(x+1)}{(x+2)}$

$$f'(x) = \frac{d}{dx} \left( \frac{x+1}{x+2} \right)$$

$$f'(x) = \frac{\frac{d}{dx} (x+1)(x+2) - (x+1) \cdot \frac{d}{dx} (x+2)}{(x+2)^2}$$

$$f'(x) = \frac{1(x+2) - (x+1) \cdot 1}{(x+2)^2}$$

$$f'(x) = \frac{1}{(x+2)^2}$$

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c.  $f(x) = (2x - 3)^4$

$$f'(x) = \frac{d}{dx} (2x-3)^4$$

$$f'(x) = \frac{d}{dg} (g^4) \cdot \frac{d}{dx} (2x-3)$$

$$f'(x) = 4g^3 \cdot 2$$

$$f'(x) = 4(2x-3)^3 \cdot 2$$

$$f'(x) = 8(2x-3)^3$$

d.  $f(x) = \sqrt[4]{x^7}$

$$f'(x) = \frac{d}{dx} (\sqrt[4]{x^7})$$

$$f'(x) = \frac{d}{dx} (x^{\frac{7}{4}})$$

$$f'(x) = \frac{7}{4} x^{\frac{3}{4}}$$

$$f'(x) = \frac{7}{4} \cdot \sqrt[4]{x^3}$$

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13. For each function, find:

- $f'(x)$
- $f''(x)$
- $f'''(x)$
- $f''''(x)$

i.  $f(x) = x^6 + 2x^4 - x^2$

$$f'(x) = \frac{d}{dx} (x^6 + 2x^4 - x^2)$$

$$f'(x) = \frac{d}{dx} (x^6) + \frac{d}{dx} (2x^4) - \frac{d}{dx} (x^2)$$

$$f'(x) = 6x^5 + 2 \cdot 4x^3 - 2x$$

$$f'(x) = 6x^5 + 8x^3 - 2x$$

ii.  $f(x) = \sqrt[4]{x}$

$$f'(x) = \frac{d}{dx} (\sqrt[4]{x})$$

$$f'(x) = \frac{d}{dx} (x^{\frac{1}{4}})$$

$$f'(x) = \frac{1}{4} x^{-\frac{3}{4}}$$

$$f'(x) = \frac{1}{4 \sqrt[4]{x^3}}$$

14. GENERAL Velocity: After  $t$  hours a freight train is

$$s(t) = 18t^2 - 2t^3 \text{ miles due north of its starting point}$$

for  $(0 \leq t \leq 9)$

- a. Find the velocity at  $t = 3$

$$\begin{aligned} s(3) &= 18(3)^2 - 2(3)^3 \\ &= 18(9) - 2(27) \\ &= 162 - 54 \end{aligned}$$

$$s(3) = 108$$

- b. Find the velocity at  $t = 7$

$$\begin{aligned} s(7) &= 18(7)^2 - 2(7)^3 \\ &= 18(49) - 2(343) \\ &= 882 - 686 \end{aligned}$$

$$s(7) = 196$$

- c. Find the acceleration at  $t = 1$

$$\begin{aligned} s(1) &= 18(1)^2 - 2(1)^3 \\ &= 18 - 2 \end{aligned}$$

$$s(1) = 16$$