1. (2 pts) $h(t) = 8t^4 + 6t^{\frac{3}{4}} - \frac{1}{3}t^{-10} + 2$ $\boxed{h'(t) = 32t^3 + \frac{9}{2}t^{-\frac{1}{4}} + \frac{10}{3}t^{-11}}$

2. We'll need the derivative as well as several evaluations for this problems here they are.

$$g(x) = x^{\frac{1}{5}}\left(x^{-4} + x^{\frac{2}{7}}\right) = x^{-\frac{19}{5}} + x^{\frac{17}{35}} \qquad g'(x) = -\frac{19}{5}x^{-\frac{24}{5}} + \frac{17}{35}x^{-\frac{18}{35}}$$

$$g(1) = 2 \qquad g'(1) = -\frac{19}{5} + \frac{17}{35} = -\frac{116}{35}$$

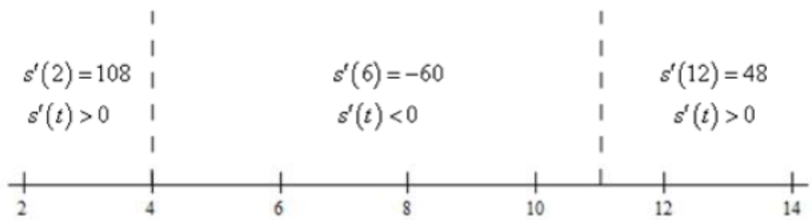
The tangent line is then : $y = g(1) + g'(1)(x-1) = 2 - \frac{116}{35}(x-1) = \boxed{-\frac{116}{35}x + \frac{186}{35}}$

4. (2 pts)

(a) $v(t) = s'(t) = 6t^2 - 90t + 264 = 6\left(t^2 - 15t + 44\right) = 6(t-4)(t-11)$

(b) The object will at rest at : $t = 4, 11$

(c) The following number line will help us answer this question.



From this number line we get the following information.

$$\boxed{\text{Moving Right : } -\infty < \text{t} < 4,\ 11 < \text{t} < \infty \qquad \text{Moving Left : } 4 < t < 11}$$

6. $\boxed{h'(t) = \left(4t - 4t^{-5}\right)\left(7t^{-1} - 3t\right) + \left(2t^2 + t^{-4}\right)\left(-7t^{-2} - 3\right)}$

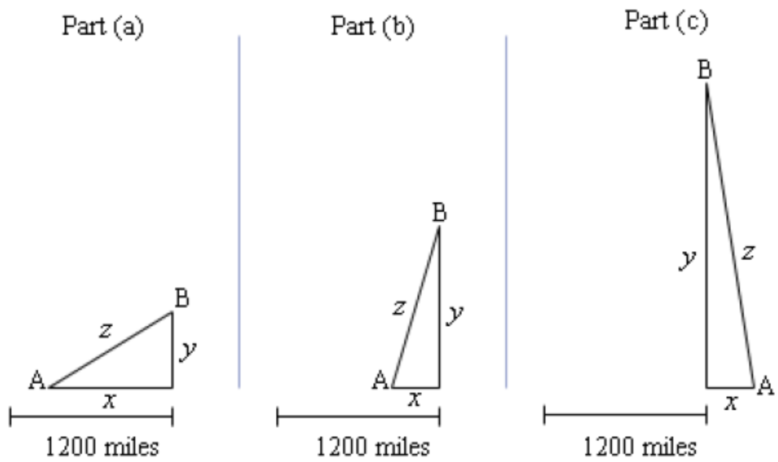
7. (2 pts) $W'(y) = \dfrac{(2y-3)\left(7-y^2\right) - \left(y^2-3y\right)(-2y)}{\left(7-y^2\right)^2} = \boxed{\dfrac{-3y^2 + 14y - 21}{\left(7-y^2\right)^2}}$

9. $\boxed{g'(t) = 8\sec(t)\tan(t) + 2t\csc(t) - t^2\csc(t)\cot(t)}$

10. $\dfrac{dy}{dz} = \dfrac{-\csc^2(z)\left(6+\sin(z)\right) - \cot(z)\left(\cos(z)\right)}{\left(6+\sin(z)\right)^2} = \boxed{\dfrac{-6\csc^2(z) - \csc(z) - \cot(z)\cos(z)}{\left(6+\sin(z)\right)^2}}$

11. (2 pts) $Y'(\theta) = 2\theta - 15\left(-\sin(\theta)\right)\sin(\theta) - 15\cos(\theta)\left(\cos(\theta)\right) = \boxed{2\theta + 15\sin^2(\theta) - 15\cos^2(\theta)}$

#6. **(2 pts)** Here is the sketch for each part of this problem and notice that for **(c)** we've actually moved past the starting point of boat B.



In each case we're going to need to find z' and to do this we'll use the Pythagorean Theorem and so we may as well set that up now and then we'll actually work the problem.

$$x^2 + y^2 = z^2 \qquad \Rightarrow \qquad z' = \tfrac{1}{z}\left(x\,x' + y\,y'\right)$$

(a) Here's all the important quantities for this part.

$$x = 1200 - 50(4) = 1000 \qquad x' = -50 \qquad y = 35(4) = 140 \qquad y' = 35$$

$$z = \sqrt{1000^2 + 140^2} = \sqrt{1019600} = 1009.7524$$

The rate at which the distance between the two boats is changing is,

$$z' = \tfrac{1}{1009.7524}\left((1000)(-50) + (140)(35)\right) = \underline{-44.6644 \text{ mph}}$$

So, in this case the distance is **decreasing**.

(b) Here's all the important quantities for this part.

$$x = 1200 - 50(18) = 300 \qquad x' = -50 \qquad y = 35(18) = 630 \qquad y' = 35$$

$$z = \sqrt{300^2 + 630^2} = \sqrt{786900} = 697.7822$$

The rate at which the distance between the two boats is changing is,

$$z' = \tfrac{1}{697.7822}\left((300)(-50) + (630)(35)\right) = \underline{10.1034 \text{ mph}}$$

So, in this case the distance is **increasing**.

(c) Here's all the important quantities for this part.

$$x = 50(26) - 1200 = 100 \qquad x' = 50 \qquad y = 35(26) = 910 \qquad y' = 20$$

$$z = \sqrt{100^2 + 910^2} = \sqrt{838100} = 915.4780$$

The rate at which the distance between the two boats is changing is,

$$z' = \tfrac{1}{915.4780}\left((100)(50) + (910)(35)\right) = \underline{40.2522 \text{ mph}}$$

So, in this case the distance is **increasing**.